PREVENTIVE PEDIATRICS

CLINICAL PEDIATRICS

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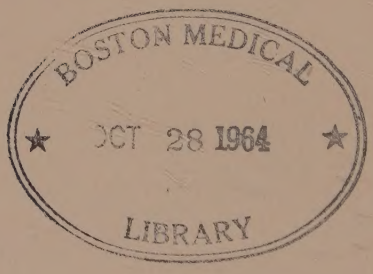

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The authors are all men of wide experience and, in the main, teachers. The combination makes the work authoritative and of the utmost service in a field which has been often termed a "therapeutic specialty."

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SECTION I

THE GROWTH AND DEVELOPMENT OF THE CHILD

PREVENTIVE PEDIATRICS

CHAPTER I

THE FIELD OF PREVENTIVE PEDIATRICS

Pediatrics as a specialty in the field of medicine is of comparatively recent origin. While disease in children has been the subject of study since the time of Hippocrates and there has been a distinct pediatric literature since the fifteenth century (most of the diseases of childhood have been recognized for generations), it has not been until recent years that the subject has been established as a separate or special entity in teaching and practice. The first chair in children's diseases in America was established in 1860 and the Section on Diseases of Children of the American Medical Association in 1880. To-day almost without exception there is a Department of Pediatrics in each of our medical schools and over two thousand physicians in the United States are finding their sole or chief field of endeavor in work with children. With this extraordinary development, if one takes into consideration the history of medicine, progress and knowledge have advanced rapidly. The fundamental fields of pathology, physiology, biochemistry, bacteriology, and immunology upon which the scientific knowledge of disease is based have been called upon and yielded a rich and valuable harvest. Much more may be expected of them in the future, particularly in regard to the prevention, treatment, and control of the infections common to childhood. Pediatrics in the past, like medicine in general, has been chiefly interested in the study and treatment of disease.

In recent years an appreciation of the greater importance of the prevention of disease, rather than its treatment and cure, has been making rapid headway, a viewpoint which more than ever stimulates the study of etiology and mechanism. Pediatrics has not only shared in this movement, but as a matter of fact is looked upon as a leader,

and so in the past ten or fifteen years there has been a rapid growth in the development of a movement which may be termed "preventive pediatrics." This is not a satisfactory term, as what we have in mind is much more than the prevention of disease. Preventive pediatrics is rather a mental viewpoint from which the subject of pediatrics is approached. There is nothing particularly new or peculiar in the subject matter which is included under the term preventive pediatrics. In pediatrics, as the word is usually interpreted, the conception is the study of the diseases of childhood, and the two terms are frequently used interchangeably. However, the approach to pediatrics is through the study of disease, or medicine; in preventive pediatrics, using this term for want of a better one and because it has a certain usage, the approach to the subject is through the child. It is this conception in fact which entitles pediatrics to be studied and practiced as a specialty. A disease has the same fundamental etiology and pathology whether it occurs in the child or the adult. Only a few conditions are distinctly peculiar to childhood and these are related to development. As the term is usually used, the practice of pediatrics is in reality the practice of general medicine less the degenerative processes. In preventive pediatrics we are primarily interested in the child, in his normal growth and development and in the means of attaining normalcy. We are interested in the prevention of morbid or abnormal conditions through general means and by specific measures. Further, and here perhaps we depart most from what is ordinarily included under the term pediatrics, we are interested in his normal mental development and psychology. We have learned *by studying the child* that no small part of the deviations from normal health and development have their origin not in biochemical or biological causes but in habits, mental reactions, and psychological conflicts. We venture to prophesy that this last field which is on the threshhold of being opened up will write the next important chapter in the scientific development of pediatrics.

By the term preventive pediatrics we do not mean child hygiene, although in many respects the two have developed hand in hand. Child hygiene is rather a field method of utilizing or applying some of the knowledge of preventive pediatrics. Many of the methods of child hygiene as at present developed are fundamentally objectionable and

undesirable and are quite contrary to the principles of preventive pediatrics.[1]

Although pediatricians are multiplying with amazing rapidity in response to the demand of the general public for a physician to care for children who knows something more than the diagnosis and treatment of disease in childhood and who has the knowledge to guide the growth and development of the child, it is a fact and will remain so for many years, that the vast majority of American children will come under the care of the "family physician." The last few years have witnessed many of these men coming into our medical centers for postgraduate courses "to learn something about children," as one expressed it. They have been stimulated to this in the majority of cases by the demands of their clientele, and their own realization that the relation of the physician to the children in his practice is something more than simply taking care of them when they are sick. It is for this group of general practitioners, and for those who cannot leave their work for courses, that this book is in large measure written. It is with this viewpoint that the attempt has been made to keep it as simple and direct, as concise and practical as possible. We are frank to admit that other methods and ways of doing things—as the feeding of the normal infant, for example—may give equal results. We are even willing to grant that there may be better ways. The methods discussed in this book are methods which have been thoroughly tested both in clinic and private practice and experience has shown that they are easily learned and used. We wish it to be clearly understood that this book aims in no way to be a complete compilation of our knowledge of the child, his growth and development. It is intended simply as a practical discussion of what we mean by preventive pediatrics. Knowledge that will enable a child to be well born, to come into the world strong and healthy, to thrive lustily and without halt during infancy, to develop and grow in a normal way during childhood, to be able physically and mentally to acquire a sound education, to acquire good habits of living and avoid bad ones, to avoid psychological abnormalities so that the child adjusts himself to his social environment, to pass through the difficult period of

[1]See Chapter XI for a discussion of this point.

puberty and adolescence into a sound normal maturity, to prevent ill health through the maintenance of good health, to prevent by scientific measures so far as we are able the infectious diseases of childhood—these are some of the aims and objects of preventive pediatrics. In its practice the physician should be the guide and mentor.

An approach to and development of the subject may be made in a number of ways. The material as a whole divides itself naturally into two main fields. One consists of the material which has to do with the normal development of the child: the physical and mental growth, nutrition and diet, hygiene, psychology, etc. The second has to do with the specific methods of prevention of abnormal conditions and diseases peculiar to or of frequent occurrence in the period of infancy and childhood. To this we have added a brief discussion of methods. In developing the material of the first part we have departed from the usual method of dividing the life of the child into periods and discussing each period in turn from different angles. Life is a continuous process. The division of the life of the child into periods has been largely the result of necessary practical divisions in child hygiene work. These periods—antenatal, neonatal, infancy, preschool age, school age, pubescence, and adolescence—are in large part arbitrary divisions. Each merges insensibly from one into another, and there is no sharp dividing line in nature. We have therefore selected to divide the material by topics rather than by age periods. As to what should or should not be included is a matter of individual choice on the part of the author. Essential and practical knowledge has been the criterion as far as possible. Many will doubtless disagree with the selection, with the scope of the contents, and the omissions. We know of no other field in which so many personal views are held by physicians in regard to the details of some of the topics within the scope of the subject. All physicians will agree on the treatment of diphtheria with antitoxin, but ask twenty pediatricians to state the age at which green vegetables should be added to the diet of an infant and note the discrepancy in the answers. In such matters the practice of the author is the basis for the statements in the text. Many of the topics have been more or less covered in the numerous manuals by physicians and others on the care of

the child. We have intentionally minimized the discussion of such topics. The fact that, despite the numerous manuals on infant and child care for the laity, there has not as yet been a discussion of preventive pediatrics for the physician is significant of the fact that the demands of the public have been responsible in large part for the development of preventive pediatrics. The medical profession has been slow, largely as a result of the scope or character of pediatric instruction in our medical schools, to consider pediatrics from our point of view. Within the last three or four years, however, such instruction is being given in our more advanced departments of pediatrics. An insistence upon the importance of the viewpoint of preventive pediatrics by no means should minimize or lessen in any way the importance of a knowledge of disease and its treatment in childhood. What the author does insist upon is that before one can intelligently practice pediatrics he must have not simply a knowledge of disease in childhood, but a knowledge of the child and its development. Perhaps after all this is in large part what we are talking about when we use the rather vague term preventive pediatrics. Perhaps a better term for the viewpoint with which we approach the subject would be "developmental" pediatrics, as it includes so much more than the prevention of disease.

CHAPTER II

HEREDITY

A discussion of the development of a child must necessarily begin with a consideration of its parents and ancestors. While the importance of heredity is obvious and we see in every child the physical features and, in general, the physical make-up of parents, grandparents, and more remote ancestors, comparatively little is known which has practical application in the field of eugenics. Excepting mental deficiency, specific pathological conditions which can be traced through generations and which follow the laws of heredity as observed in the study of animal and plant life are few and relatively unimportant. This is true in large part because the vast majority of diseases which affect the human being are either infectious in nature or have their origin in the environment and manner of living of a given individual.

The hereditary conditions, concerning which the greatest amount of data has been collected, are chiefly physical or structural traits or abnormalities which follow more or less closely the mendelian laws of inheritance. Certain skeletal changes as polydactylism, syndactylism, and osteopsathyrosis are clearly inherited. Hair color and type of hair and the color of the eye are further examples of physical characteristics determined by heredity. Huntington's chorea, Friedreich's disease (hereditary ataxy), diabetes insipidus, and alkaptonuria are pathological conditions which are inherited according to the mendelian law. A more important group is one in which the condition is not only inherited but in addition is sex-linked. In these conditions the male as a rule shows the peculiar unit character, but the transmission is through the female. The conditions are recessive in the mendelian sense. Some forms of muscular atrophy, hemophilia, optic atrophy, and color-blindness are examples of sex-linked inherited conditions.

If these were all the factors involved in inheritance the subject would be of little practical importance to the physician. They constitute, however, simply a group about which we have definite information. Pedigree charts showing the inheritance of these conditions through many generations are available in all books on heredity. However, the subject of heredity is of much greater importance because the individual child reflects in a more indefinite but not less important way the physical and mental traits of its ancestors.

Inheritance of Mental Ability.—In discussing general mental ability, special mental traits, or talents, as the musical or artistic, the question of environment enters in as an indefinite factor or influence, but one that must be recognized. That general mental ability may be inherited is the conclusion usually drawn from the study of certain families where for generations there have been an unusual proportion of its members acquiring eminence in occupations requiring mental activity and intelligence above the average. At the same time it is true that the children in such families live from early infancy in an environment which tends to develop to an unusual degree the basic or fundamental mentality with which the child is endowed at birth, and amidst surroundings which afford an opportunity for attaining positions of eminence. Modern psychological tests, however, have shown that only a small percentage of individuals are endowed with unusual mental gifts, and have given a method by means of which the inheritance of general mental ability can be more closely studied. Where special mental traits or talents are concerned the evidence of inheritance becomes more positive. Musical ability, artistic talents, and mathematical ability have all been studied by Davenport and others and the evidence points to distinct inherited tendencies. Here again environment must be considered as a factor, for in all these examples the opportunity has been offered by the environment to develop the talent to its fullest degree.

Subnormal Mentality.—Studies upon the inheritance of subnormal mental ability or feeble-mindedness have been of the greatest importance, for not only do the feeble-minded form one of our largest group of social dependents, but, so far as the application of our knowledge of heredity has practical importance in eugenics, the field is at

the present time practically limited to feeble-mindedness. Many data have been accumulated by many workers and it has been shown that feeble-mindedness is a defect inherited as a mendelian recessive. When two defectives marry, the offspring is always defective, and when one parent is defective a large percentage are feeble-minded. It is estimated that at the present time there are approximately 400,000 feeble-minded in the United States and that two-thirds of them have feeble-minded parents. In nearly all of the others there is a feeble-minded grandparent or even two. The lack of moral sense of the feeble-minded renders them exceedingly prolific and the problem of feeble-mindedness is one of our major social problems. It can only be solved through segregation or other methods which preclude the possibility of propagation of further defectives.

As far, then, as we are able to speak definitely of heredity, the chief importance to the child lies in the prevention of feeble-mindedness. The marriage of individuals with hemophilia, Huntington's chorea, and the other conditions mentioned above, means that a certain percentage of the offspring will develop the condition, or in the case of the sex-linked conditions the female children will in turn transmit it to their male offspring.

General Physical Inheritance.—Leaving the field of heredity, concerning which we have rather definite facts regarding the transmission of specific unit characteristics, it is necessary to consider in a broad way the inheritance of the general physical make-up of the child. That such inheritance occurs is obvious. Thus children from the day of birth carry the physical features of their parents and ancestors. As they grow and develop they take on the type of body habitus of their families. Children of tall parents are usually tall, while the children of short or small parents usually develop the physique of their parents. In some families unusual muscular development runs through generations and excessive adiposity or tendency toward obesity is frequently a familiar trait. Where there is marked difference in the body type of the parents we see some children carrying the physique of one parent and some the other, and at times a composite or mean picture. Not infrequently a child will have the features and physical make-up of some one of the grandparents.

While the impossibility of experimental research together with the small number of offspring and the long period of time between human generations make it impossible to study accurately the laws of heredity which govern the transmission of the factors involved, it is clearly obvious that they play a dominating rôle in determining the character of the physical make-up with which the child is endowed at birth. That all are born equal is directly contrary to the truth from a physical and mental standpoint.

To the physician, moreover, there are certain facts of importance which are not so obvious to the public at large. There is a tendency for certain types of disease, as cancer, to run in families that is more than the law of chance. The mechanism of this is not clear as to whether it is a cellular peculiarity or a lack of resistance. The asthma-eczema group is another type. The peculiar tendency which certain groups of children show to the hyperplasia of the lymphoid tissue or the tendency to eczema or in reaction to infections have led to these frequently being grouped as "constitution" or "diathesis." These differences are inherited traits or tendencies. If they cannot be clearly traced through generations, like certain physical abnormalities, as polydactylism, nevertheless they are physical peculiarities which depend upon factors transmitted to the offspring by the parents and not to environmental conditions.

This fundamental difference in physical composition which infants and children show is of great importance to the pediatrist. Two young infants of the same age and weight, born of healthy and vigorous parents, who have passed through their antenatal life and been brought into the world without difficulty, and who have both been breast fed, will often show striking physical variations. The one will be strong and muscular, with clear skin and splendid tonus, while the other will be soft and flabby. Infants born under similar conditions and fed with the same technic and living in a good hygenic and social environment show marked differences in the way they thrive. Anyone who has observed large numbers of children in an infant welfare station knows how some babies come in for examination with a feeding history that breaks every one of the accepted rules of infant feeding, and yet are splendid physical specimens. Other

babies who are reared with all of our present knowledge of infant nutrition never thrive and do well. The only explanation is that the "constitution" which the child inherits differs markedly. It has always seemed strange to the author that this factor, which is one of fundamental importance, is either not considered or vaguely glossed over in our many treatises on infant feeding and nutrition. It is the same with an infant as with a machine: if a machine is defective in its manufacture the best care will never make it run smoothly or at high efficiency. Infant feeding, however, has been concerned with the care of the machine rather than with its manufacture, and nearly all of our work on infant feeding is developed on the theory that the chief essential is the care of the machine, and ignores the material we have to work upon. The reason for this perhaps lies in the fact that in the care and feeding of the infant we have factors within our control and study, but that in the present state of society we have practically no control of inherited factors, nor, excepting mental deficiency and other relatively unimportant conditions mentioned, any specific knowledge that we can apply practically in the field of eugenics.

What applies to the infant applies likewise to the older child. The study of body weight, growth, etc., and the use of height-weight tables for the discovery of malnutrition have led to the general impression among the laity that children should fall into a mean or average. The question of body habitus—the tall, the stocky, the thin, the fat—is a factor dependent chiefly upon heredity and not upon diet, rest, fatigue, and the like. This question will be gone into more closely in the chapter on malnutrition.

Heredity and Environment.—The vast majority of children are brought into the world with the strength and vitality to live and grow and develop into useful, normal citizens. While, as has been pointed out, there may be a considerable difference in their physical make-up, the absolute number of defectives, physical or mental, is relatively small. The chief factors which influence the mortality rates in infancy are not determined by heredity but by the conditions of living surrounding the child. Thus economic conditions, failure of breast feeding as the result of ignorance and the lack of medical knowledge and advice of the ways to maintain breast feeding, un-

sanitary housing, exposure to infections, lack of personal hygiene, impure water and milk supplies are the chief factors which affect the mortality rates in infancy and childhood. These are the chief points of attack of preventive pediatrics. While there is no question that if the human race could be bred along the lines which have been utilized in the breeding of stock a line of physically stronger individuals would in time be produced, the matter of human breeding is one controlled almost absolutely by economic and social factors which are environmental conditions. Our efforts in eugenics are and will be for a long time directed to elimination of the unfit rather than to the breeding of the "more fit."

A certain group of biologists have, in a sense, decried child health and welfare activities on the theory that such work tended to bring about the survival of the weakling and unfit, who, if left alone, would tend to eliminate his strain from the human race, thus leaving, in the long run, only the fittest and their progeny to survive. They argue that in this way the human race would become better and stronger. There would be an obvious truth in this if all infants and children were brought up in the same way, under the same conditions of living and housing, under similar economic circumstances, and exposed to the same infections under like conditions. But the truth of the matter is that the environmental conditions of to-day are the chief factors in determining the survival of an infant. The statement has even been made that a lowering of the infant mortality rate would bring about an increase in mortality rate in the succeeding years. This statement has proved to be false. A low infant mortality rate has gone hand in hand with a general improvement in morbidity and mortality rates, and in communities where through organized effort the death-rate for infants has been lowered the death-rate for older children has not increased but on the contrary has declined. Child health fundamentally has to do with the improvement of the environment and the protection of the infant and child from conditions and diseases which influence his well-being. An inherently strong child brought up in filth and unhygienic conditions has less chance of living and developing normally than one inherently weaker but protected from factors which bring about infant mortality.

CHAPTER III

GROWTH, PHYSICAL DEVELOPMENT, AND POSTURE

GROWTH AND PHYSICAL DEVELOPMENT

The subject of the growth and physical development of the child is of fundamental importance in preventive pediatrics. Innumerable studies of growth and development have been made, and if all phases and aspects were considered the material would make a text in itself. It has been necessary, therefore, to limit the discussion in this chapter to the material which the physician uses more or less constantly in his routine work and with which he must be familiar.

The biochemistry of growth is important, but scarcely within our field. Growth is dependent upon many factors. Certain definite chemical substances, proteins, must be furnished the organism and these in certain definite or specific atomic groupings. The food as a whole must have a certain minimum energy value. In addition certain rather indefinite chemical substances, "accessory food substances" or "vitamins," must be furnished. While all these are necessary for growth they do not in themselves bring about growth. In addition substances must be present which may be regarded as having an action similar to the action of the catalyzers of a chemical reaction. Although little is known of a definite nature in regard to these "growth catalyzers," they are seemingly the product of the activity of the endocrine glands.

Growth during infancy and childhood is a continuous process. It is not, however, a uniform process. It does not proceed at a constant rate, but the growth curve is characterized by periods or cycles of acceleration in rate or velocity. During the first year of life growth takes place with remarkable velocity. On an average there is a gain in weight of 200 per cent of the birth weight and a growth in length of from 40 to 50 per cent. Even at this period the rate

is not uniform, as it is most rapid in the first 6 months and slows gradually toward the end of the year. After this slowing in the rate there is a period of fairly steady growth in weight and height lasting until the ninth to tenth year in girls and the tenth to eleventh year in boys. At this time the rate becomes accelerated again and a rapid increase in growth takes place for several years. This is the pubescent cycle of the growth curve which ends with the slowing that takes place in early adolescence.

No terms have been more misused and more misunderstood than the terms normal growth and normal weight. In fact these terms are practically undefinable and cannot be used in a comparative way between different individuals. What is normal development and growth for one child may be distinctly abnormal or pathological for another. The world is made up of races which differ in stature and physique and in the rapidity of development. Each racial group is made up of various types of individuals, the tall and the short, the slender and the stout. Each individual in this respect is the product of his inheritance and the original germ cells determine the physical characteristics or type of body habitus of the individual. Only the environmental factors which influence the growth of the individual—food, hygiene, and disease—are under our control and it is only as we are able to supervise or control these in relation to the individual that we can influence the matter of growth or development.

Innumerable studies of the growth and rate of development of children have been made by statistical methods. Measurements of weight and height are of most importance, as they furnish the simplest means of graphically recording growth and development. Most of these studies have been reduced to tables of averages or means giving the average weight or height for age, or the average weight for height. These have been of great value in showing racial, sex, and age differences, and in furnishing data in regard to periodic increments in weight and height. Such tables, however, are of limited value for purposes of comparative use with a given individual. The average or mean figure given in a table is made up of many figures above and below this figure. Further, the child should correspond closely with the classification of the material from which the table

was constructed. The older tables which are so frequently quoted in our textbooks are chiefly tables of age differences in height and weight. These have been found to be of little value, as normal healthy children of different ages vary tremendously in size. While the average 11-year-old boy is 56 inches tall and weighs 75 pounds, normal healthy boys of 11 years of age may be anywhere from 50 to 62 inches in height and the average weight figure is the mean of weights from 55 to 95 pounds. Studies of recent years have shown that there is a much closer relationship between the height and weight than in any ratio introducing the age factor, and the more recent tables are constructed on the height-weight ratio. The question of age can largely be disregarded in young children, but it becomes of importance during the period of pubescence. Under 10 years of age children of different ages but the same height average about the same in weight, while the children of the same age but different heights, it will be found, vary from 2 to 4 pounds for each inch difference in height.

Statistics.—From the large number of statistical tables available we have selected a few which have been found of practical value. Although growth is a continuous process it is convenient to discuss development by periods for the reason that the material has been largely studied and collected in this manner.

Infancy.—In early prenatal life the growth of the embryo is slow. At about the fifth month the rate or velocity begins to accelerate and rapid growth takes place from this time until birth. At birth normal babies show quite marked variations from average birth weight figures. One of the most important factors responsible for this variation is the length of gestation. This is a figure difficult or impossible to calculate exactly for each individual infant and yet we know it is a figure that varies considerably. A period of 10 days in either direction from a mean of 280 days definitely influences the birth weight. It is also known that the diet and life (occupation) of the mother during the latter part of the period of gestation influences the birth weight of the full-term infant. Leaving such individual factors out of consideration, group statistics show that the average weight for infants at birth varies according to race and sex, as is shown in the following table.

TABLE I

VARIATION IN BIRTH WEIGHT BY RACE AND SEX (AVERAGES)

TYPE OF MATERIAL	BIRTH WEIGHT (OUNCES)	
	Males	Females
American (New England)	120.8	115.7
American (white)	128	130.7
American (colored)	120	118
English	113.6	110.4
Australian	127.3	121.3
German	122	114
Japanese	103.7	98.1
Russian	122	117

As the average American infant is a mixture of racial stocks, quite wide variations from the mean or average birth weight can be expected and the birth weight still be within what we may call "normalcy" for want of a better term. While the average birth weight of infants in the United States is a little over 7 pounds, one infant of 6 pounds may be as normal as another weighing 9 pounds at birth. This individual variation may continue to a greater or less degree throughout childhood when individual children are compared.

In the same way there is considerable variation in the length or height of the newborn infants—a difference attributable to sex, race, and body type of the parents.

TABLE II

LENGTH OF NEWBORN INFANTS BY RACE AND SEX (AVERAGES)

TYPE OF MATERIAL	LENGTH, CENTIMETERS	
	Males	Females
American (New York)	52.5	52.2
American (Iowa)	52.3	53.8
English	49.6	49.1
German	51	49
French	49.9	49.2

In Table III is shown the average height and the average weight of infants at different age periods in the first two years of life. It in no way indicates what the individual infant should weigh or measure.

TABLE III

AVERAGE WEIGHT AND HEIGHT OF INFANTS AT AGE PERIODS (NUDE WEIGHTS)

AGE		BOYS			GIRLS		
		WEIGHT		Height, Inches	WEIGHT		Height, Inches
Years	Months	Pounds	Ounces		Pounds	Ounces	
Birth	0	7	8	20.6	7	1	20.5
	1	8	8	21.6	8	1	20.9
	2	10	6	22.5	9	14	22.3
	3	11	13	23.5	11	5	23.2
	4	13	3	24.5	12	11	24.2
	5	14	10	25.5	14	2	25.1
	6	16	0	26.5	15	8	26.0
	7	16	14	27.0	16	6	26.5
	8	17	11	27.5	17	3	27.0
	9	18	8	28.0	18	0	27.5
	10	19	5	28.5	18	13	28.0
	11	20	3	29.0	19	11	28.5
1	0	21	0	29.5	20	8	29.0
1	1	21	9	29.9	21	1	29.4
1	2	22	2	30.3	21	11	29.8
1	3	22	12	30.7	22	4	30.2
1	4	23	5	31.1	22	13	30.6
1	5	23	15	31.6	23	7	31.0
1	6	24	8	32.0	24	0	31.4
1	7	25	0	32.4	24	7	31.7
1	8	25	8	32.7	24	13	32.0
1	9	25	15	33.1	25	4	32.4
1	10	26	6	33.4	25	10	32.8
1	11	26	14	33.7	26	1	33.1
2	0	27	5	34.0	26	8	33.4

More important than this is the following table, compiled by the Division of Child Hygiene of the State of New York, showing the average weight for height (length) of infants.

TABLE IV

AVERAGE WEIGHT FOR HEIGHT OF INFANTS (NUDE WEIGHTS)

HEIGHT, INCHES	WEIGHT, POUNDS		HEIGHT, INCHES	WEIGHT, POUNDS	
	Boys	Girls		Boys	Girls
24	13¼	13	30	22	21¼
24¼	13½	13½	30¼	22¼	21½
24½	14	13¾	30½	22½	22
24¾	14½	14¼	30¾	23	22¼
25	14¾	14½	31	23¼	22½
25¼	15¼	15	31¼	23½	22¾
25½	15½	15¼	31½	23¾	23¼
25¾	15¾	15¾	31¾	24¼	23½
26	16¼	16	32	24½	23¾
26¼	16½	16½	32¼	24¾	24
26½	17	16¾	32½	25	24½
26¾	17½	17¼	32¾	25½	24¾
27	18	17½	33	25¾	25
27¼	18¼	18	33¼	26	25½
27½	18¾	18¼	33½	26½	25¾
27¾	19	18½	33¾	26¾	26
28	19½	19	34	27	26½
28¼	19¾	19¼	34¼	27½	26¾
28½	20	19½	34½	27¾	27
28¾	20½	19¾	34¾	28	27½
29	20¾	20¼	35	28½	27¾
29¼	21	20½			
29½	21¼	20¾			
29¾	21¾	21			

Preschool Years.—Fewer studies have been made of the growth of children during this period than of the growth during infancy and during school age. Table V is similar to Table IV, except that it is constructed for children from 35 inches—the average height at 30 months—to children 48 inches in height.

Table VI, which has been prepared by Woodbury of the Children's Bureau from heights and weights selected from the material gathered from all parts of the United States in the weighing and measuring campaign of the Bureau in 1918, takes into consideration weights and heights for age. It is of course a table of averages and means. It shows the average weight for children of different heights at a given age.

TABLE V

AVERAGE WEIGHT FOR HEIGHT OF PRESCHOOL CHILDREN (NUDE WEIGHTS)

HEIGHT, INCHES	WEIGHT, POUNDS		HEIGHT, INCHES	WEIGHT, POUNDS	
	Boys	Girls		Boys	Girls
35	28½	27¾	42	38½	37¾
35¼	28¾	28	42¼	39	38¼
35½	29¼	28½	42½	39¼	38½
35¾	29½	28¾	42¾	39¾	39
36	29¾	29¼	43	40¼	39½
36¼	30¼	29½	43¼	40½	40
36½	30½	29¾	43½	41¼	40¼
36¾	30¾	30¼	43¾	41¼	41¼
37	31¼	30½	44	42	42
37¼	31½	30¾	44¼	43	43
37½	32	31¼	44½	44	44
37¾	32¼	31½	44¾	45	44¾
38	32¾	31¾	45	46	45¾
38¼	33	32¼	45¼	47	46½
38½	33¼	32½	45½	48	47½
38¾	33¾	32¾	45¾	49¼	48
39	34	33¼	46	49¾	48½
39¼	34¼	33½	46¼	50¼	49
39½	34¾	34	46½	51	49¾
39¾	35	34¼	46¾	51½	50¼
40	35½	34½	47	52	50¾
40¼	35¾	35	47¼	52½	51¼
40½	36	35¼	47½	53¼	51¾
40¾	36½	35¾	47¾	53¾	52½
41	37	36	48	54½	53
41¼	37¼	36½			
41½	37¾	37			
41¾	38¼	37¼			

School Age.—A large amount of statistical material has been gathered regarding measurements of development of children of school age. The early tables based on weight for age are of little practical value, as they do not take the more important height-weight ratio into consideration. As children grow older the differences in body type due to race and inherited factors become more striking and more important. It is doubtful if any one table will ever be entirely satisfactory as it is impossible to construct a table taking all of these factors into consideration. The most useful tables at present are the Baldwin-Wood tables (VII and VIII) showing the average weight for height by sexes for yearly age periods.

The Baldwin-Wood tables are largely based upon measurements made of children in the better class private schools and hence almost entirely of children of American-born parents. In this sense it is

TABLE VI

WEIGHT-HEIGHT-AGE TABLE FOR CHILDREN OF TWO TO SIX YEARS

HEIGHT, INCHES	BOYS						GIRLS					
	Average Weight for Height, Pounds	24 Months	30 Months	36 Months	48 Months	60 Months	Average Weight for Height, Pounds	24 Months	30 Months	36 Months	48 Months	60 Months
30	22	22					21½	21				
31	23	23	24				22½	23	23			
32	24½	25	25				24	24	24	25		
33	26	26	26	26			25	25	25	26		
34	27	27	27	27			26½	26	26	27		
35	29½	29	29	29	29		29	29	29	29	29	
36	31	30	31	31	31		30	30	30	30	30	31
37	32	32	32	32	32	32	31½	31	31	31	31	32
38	33½		33	33	33	34	32½		33	33	33	33
39	35		35	35	35	35	34		34	34	34	34
40	36½			36	36	36	35½			35	36	36
41	38				38	38	37½				37	37
42	39½				39	39	39				39	39
43	41½				41	41	41				40	41
44	43½					43	42½					42
45	45½					45						

NOTES:

1. Weight is stated to the nearest pound; height to the nearest inch; age to the nearest birthday.
2. Up to and including 34 inches the *weights are net.* Above this the following amounts have been added for clothing (shoes, coats and sweaters are not included):

   35 to 39 inches 1¼ pounds
   40 to 44 inches 1½ pounds

selected material. It has the disadvantage to the physician that the weights are not nude weights. This on the other hand is of practical value in weighing children in public schools when only shoes, heavy coats, and sweaters can be removed. The difference between the actual weight and the weight with the allowance for clothing in the table is immaterial.

The Increment in Height and Weight at Different Ages.—In a sense the question of how much a child should grow or gain from time to time is even more important than the question of actual measurements of height and weight. It is inherent in every organism to grow steadily from infancy to maturity, but the rate of growth is not constant and varies from time to time. Further, variations or deviations from the average gain between fixed periods may be much more

TABLE VII

Weight-Height-Age Table for Boys of School Age

Height, Inches	Average Weight for Height (Pounds)	5 Years	6 Years	7 Years	8 Years	9 Years	10 Years	11 Years	12 Years	13 Years	14 Years	15 Years	16 Years	17 Years	18 Years	19 Years	Height, Inches
38	34	34	34														38
39	35	35	35														39
40	36	36	36														40
41	38	38	38	38													41
42	39	39	39	39	39												42
43	41	41	41	41	41												43
44	44	44	44	44	44												44
45	46	46	46	46	46	46											45
46	48	47	48	48	48	48											46
47	50	49	50	50	50	50	50										47
48	53		52	53	53	53	53										48
49	55		55	55	55	55	55	55									49
50	58		57	58	58	58	58	58	58								50
51	61			61	61	61	61	61	61								51
52	64			63	64	64	64	64	64	64							52
53	68			66	67	67	67	67	68	68							53
54	71				70	70	70	70	71	71	72						54
55	74				72	72	73	73	74	74	74						55
56	78				75	76	77	77	77	78	78	80					56
57	82					79	80	81	81	82	83	83					57
58	85					83	84	84	85	85	86	87					58
59	89						87	88	89	89	90	90	90				59
60	94						91	92	92	93	94	95	96				60
61	99							95	96	97	99	100	103	106			61
62	104							100	101	102	103	104	107	111	116		62
63	111							105	106	107	108	110	113	118	123	127	63
64	117								109	111	113	115	117	121	126	130	64
65	123								114	117	118	120	122	127	131	134	65
66	129									119	122	125	128	132	136	139	66
67	133									124	128	130	134	136	139	142	67
68	139										134	134	137	141	143	147	68
69	144										137	139	143	146	149	152	69
70	147										143	144	145	148	151	155	70
71	152										148	150	151	152	154	159	71
72	157											153	155	156	158	163	72
73	163											157	160	162	164	167	73
74	169											160	164	168	170	171	74

The following percentage of net weight has been added for clothing (shoes, coats and sweaters are not included):

For weights from 35 to 63 pounds—3.5 per cent of net weight is added.
For weights 64 pounds and over—4 per cent of net weight is added.

TABLE VIII

Weight-Height-Age Table for Girls of School Age

Height, Inches	Average Weight for Height, Pounds	5 Years	6 Years	7 Years	8 Years	9 Years	10 Years	11 Years	12 Years	13 Years	14 Years	15 Years	16 Years	17 Years	18 Years	Height, Inches
38	33	33	33													38
39	34	34	34													39
40	36	36	36	36												40
41	37	37	37	37												41
42	39	39	39	39												42
43	41	41	41	41	41											43
44	42	42	42	42	42											44
45	45	45	45	45	45	45										45
46	47	47	47	47	48	48										46
47	50	49	50	50	50	50	50									47
48	52		52	52	52	52	53	53								48
49	55		54	54	55	55	56	56								49
50	58		56	56	57	58	59	61	62							50
51	61			59	60	61	61	63	65							51
52	64			63	64	64	64	65	67							52
53	68			66	67	67	68	68	69	71						53
54	71				69	70	70	71	71	73						54
55	75				72	74	74	74	75	77	78					55
56	79					76	78	78	79	81	83					56
57	84					80	82	82	82	84	88	92				57
58	89						84	86	86	88	93	96	101			58
59	95						87	90	90	92	96	100	103	104		59
60	101						91	95	95	97	101	105	108	109	111	60
61	108							99	100	101	105	108	112	113	116	61
62	114							104	105	106	109	113	115	117	118	62
63	118								110	110	112	116	117	119	120	63
64	121								114	115	117	119	120	122	123	64
65	125								118	120	121	122	123	125	126	65
66	129									124	124	125	128	129	130	66
67	133									128	130	131	133	133	135	67
68	138									131	133	135	136	138	138	68
69	142										135	137	138	140	142	69
70	144										136	138	140	142	144	70
71	145										138	140	142	144	145	71

The following percentage of net weight has been added for clothing (shoes and sweaters are not included):

For weights from 35 to 65 pounds—3 per cent of net weight is added.
For weights from 66 to 82 pounds—2.5 per cent of net weight is added.
For weights from 83 pounds and over—2 per cent of net weight is added.

important at one time than at another. In infancy not only the relative but the absolute growth is much greater than when the child reaches the school years. As puberty is approached sex and age enter in as important factors.

As increase in weight and height are the most obvious and striking characteristics of growth in children and the most easily measured, a record of growth based on these measurements furnishes the simplest method of following the development of the individual. While it tells nothing specific regarding the constitution of the organism, the character and type of the tissues and muscles, the development of the heart and other viscera, one can be reasonably sure that if the growth of an individual proceeds at a steady rate and if the periodic gain approximates the average gain for that period there is nothing radically wrong in the development of the individual child. In childhood variations in the way of a failure of periodic gain in weight offer a sensitive index to environmental faults affecting growth in the way of qualitative or quantitative dietary defects, the presence of disease, or even psychological or behavior difficulties.

Infancy.—Normal infants gain approximately 200 per cent of the birth weight in the first year. Approximately one-half of this is gained in the first 5 months and the other half in the remaining 7. After the initial loss in the first few days of life there is rapid gain. About the ninth or the tenth month there is a distinct slowing of the growth velocity in both breast and artificially fed infants.

The average gain per month expressed in ounces is approximately as follows in the first year:

TABLE IX

AVERAGE MONTHLY WEIGHT GAIN IN FIRST YEAR

Month	Birth to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	10 to 11	11 to 12
Gain, ounces	24	30	24	24	22	18	16	16	14	12	12	14

During the second year there is a gain of from 6½ to 7 pounds distributed fairly uniformly at the rate of slightly over one-half pound per month.

These of course are average figures and no individual infant gains at exactly this rate. But as in infancy the rate of gain of body weight is so great, small variations of a pound or more are much more important than at a later period, and we know by experience that the weight curve is the most sensitive index we possess of the health of the infant. Slight disturbances of one kind or another are mirrored rapidly in the weight curve as they bring about definite fluctuations in the periodic gain.

Growth in length is likewise rapid during the first 2 years of life. At birth the average baby is from 20 to 21 inches long. The increase by periods is as follows:

TABLE X

AVERAGE PERIODIC LENGTH INCREASE IN FIRST TWO YEARS

Increase	Birth to 3 Months	3 to 6 Months	6 to 9 Months	9 to 12 Months	12 to 18 Months	18 to 24 Months
Increase, Inches	3½–4	1½–2	1½–2	1–1½	2–3	1½–2

Preschool Age.—During the preschool years the average gain in weight and height is as follows:

TABLE XI

AVERAGE WEIGHT AND HEIGHT GAIN FROM TWO TO SIX YEARS

Gain	2 to 3 Years	3 to 4 Years	4 to 5 Years	5 to 6 YEARS
Gain Height, Inches	2½–3	2½–3	2–2½	2
Gain Weight, Pounds	4	4	4	4

School Age.—As the school years are reached, types of body habitus become more differentiated. The yearly gain in height and weight is directly related to the type of habitus and hence this factor must be taken into consideration in the construction of tables of growth. As a general rule tall children tend to put on weight at an earlier age than short children, the height-weight ratio or proportion being more important than the relation of age to height and weight.

The following table (Baldwin-Wood) gives the average annual gain in weight and increase in height for boys and girls of different body types.

TABLE XII

AVERAGE ANNUAL GAIN IN WEIGHT AND HEIGHT FOR SCHOOL AGE CHILDREN OF DIFFERENT BODY TYPES

BODY TYPE		BOYS													
Age, Years		6	7	8	9	10	11	12	13	14	15	16	17	18	19
Average Height, Inches	Short	43	45	47	49	51	53	54	56	58	60	62	64	65	65
	Medium	46	48	50	52	54	56	58	60	63	65	67	68	69	69
	Tall	49	51	53	55	57	59	61	64	67	70	72	72	73	73
Average Annual Gain, Pounds	Short	3	4	5	5	5	4	8	9	11	14	13	7	3	
	Medium	4	5	6	6	6	7	9	11	15	11	8	4	3	
	Tall	5	7	7	7	7	8	12	16	11	9	7	3	4	
		GIRLS													
Average Height, Inches	Short	43	45	47	49	50	52	54	57	59	60	61	61	61	
	Medium	45	47	50	52	54	56	58	60	62	63	64	64	64	
	Tall	47	50	53	55	57	59	62	64	66	66	67	67	67	
Average Annual Gain, Pounds	Short	4	4	4	5	6	6	10	13	10	7	2	1		
	Medium	5	5	6	7	8	10	13	10	6	4	3	1		
	Tall	6	8	8	9	11	13	9	8	4	4	1	1		

Pubescent Growth Cycle.—At about the ninth to tenth year the second cycle of accelerated velocity of growth begins. Children who have been increasing in weight for a number of years at the rate of 4 to 5 pounds suddenly begin to grow rapidly in height and take on weight. Sex now enters for the first time as an important factor, as the pubescent growth cycle in girls begins from one to two years before that of boys and the average stature of girls at 13 years is greater than that of boys. Although these differences will be noted in Table XII, the following figures show the difference in the pubescent cycle in the sexes in a graphic way.

Puberty is reached earlier in the girls than in the boys. The average age of puberty for girls as measured by menstruation is 13¾ years. It varies considerably in individuals and race plays a factor. In 20 per cent of the girls puberty develops in the twelfth to thirteenth year period, in 40 per cent in the thirteenth to fourteenth, and in 20 per cent in the fourteenth to fifteenth year period. In boys the mean age as accurately as can be measured is around 14 years, although it may occur as early as the tenth year or as late as the seventeenth. Puberty is of course a physiological age rather than an anatomical

age. Children of the same chronological age may show a difference amounting to several years in their physiological age and the develop-

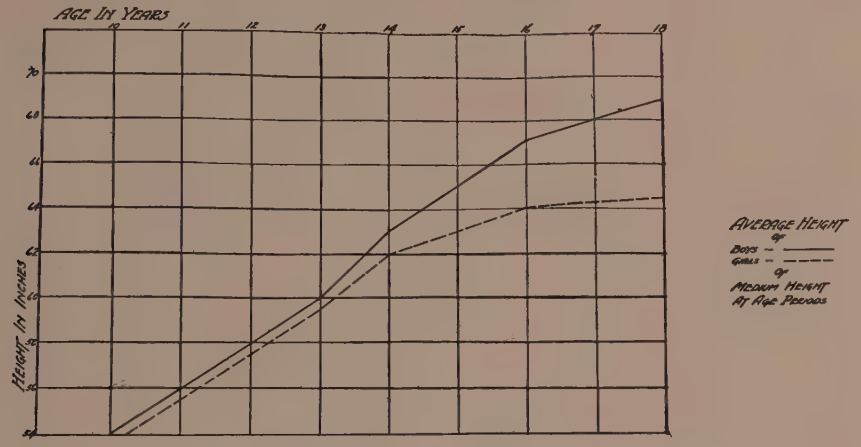


FIG. 1.—AVERAGE ANNUAL GROWTH IN HEIGHT DURING PUBESCENT YEARS.

ment associated with the latter and still be perfectly "normal" in their physical growth and development.

Variation.—The figures in the above tables are figures of averages or means. By comparing the measurements of an individual child

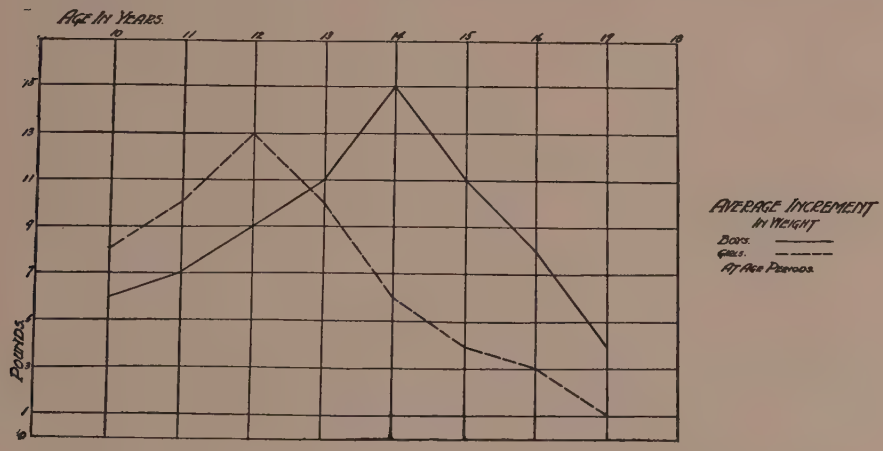


FIG. 2.—AVERAGE ANNUAL GAIN IN WEIGHT DURING PUBESCENT YEARS.

with the measurements of the tables, one can find whether the child is average or above or below the average of the type of material upon which the table is constructed. It tells little, however, as to whether

the height and weight of the child are "normal," the form in which the question is usually asked by parents. There is a certain deviation in individual heights and weights above and below the average line which is as "normal" as the "average" measurement. The standard deviation from the mode in infancy is around 15 per cent expressed in percentage terms. The tables show the variation in average figures due to sex and in older children the variation resulting from differences in body type. To show variation resulting from racial strains would require many tables. When the averages in the Baldwin-Wood tables are contrasted with tables constructed from different types of material, distinct differences due to racial stock are found. Thus the average height of a boy of 9 years of Southern European parentage is 2 inches less than the average height of a nine-year-old boy of American parentage. At the same time his average weight is the same or a little more. This illustration, as will be seen, is sufficient to point out the limitations of any one table of average height or measurements.

Height, Weight and Development.—There has been a tendency in recent years to look upon weight and nutrition as more or less one and the same thing, and to classify the nutritional condition of the child by the relationship of his weight or height-weight ratio to average figures. More or less arbitrary lines of this or that percentage below and above average have been drawn and the nutritional condition of the child has been considered satisfactory or unsatisfactory according to whether the weight lay within or beyond these lines. Physical measurements of height and weight alone cannot be used to determine the nutritional condition of the individual child, as the nutrition involves other factors, such as tissue tonus, muscular development, anemia, posture, and the like, which can only be determined by a physical examination. The height-weight ratio is only one of a number of factors which must be taken into consideration. It is true nevertheless that the majority of children who are undernourished will have a height-weight figure 10 per cent or more under the average height-weight figure, and in this way the tables serve as a method of rapid differentiation of large groups of children. Careful examination will show good nutrition in children 10 per cent under the height-

weight ratio measurement and often children of average weight for height are poorly nourished.

The importance of measurements of height and weight lies chiefly in the fact that they furnish the best, and at the same time the simplest, method of watching and recording the development of the individual child. The child is a growing, developing organism and his growth should be continuous. By measuring the height and weight periodically one can determine and record if the child is developing, and further, if the growth is following the periodic gain which might be expected. In this sense the tables of average periodic gain are of more importance than the tables of absolute measurement of average height and weight. Individual variability must be taken into consideration, and, as will be noted from the tables, variability in weight is greater than variability in height and the degree of variability increases with age.

The weight curve in infancy furnishes the most delicate index we possess of the progress of the infant. It is easily affected by slight changes in the food and shows clearly environmental changes as hygienic faults and disease. As the child grows older small variations are not as important as in infancy. There is also a certain seasonal variation which becomes more marked as the children grow older. The best gain is usually in the fall months and a large part of the average annual gain may be put on in a few months. This may be followed by a period of several months during which no gain is made. In infancy such irregular gain would be very important and the failure to gain for several months would be significant of something decidedly wrong, while in older children it might be unimportant. Some children make almost their entire yearly gain during the summer vacation months. In children of school age measurements every year give sufficient information as to the development of the child. In order to keep a record of development some form of graphic chart is advisable.

Other Measurements of Growth.—So far we have spoken of growth as related to measurements of height or length and weight. There are many other measurements and ratios which have been studied but most of these are chiefly of interest in anthropology,

as sitting height, the length of arms, relation of head to trunk, etc., and we are limiting our discussion to those measurements which are of practical importance to the physician. The general relationship of proportion between the different parts of the body as the child grows is well shown in a graphic manner in the following figure by Stratz.

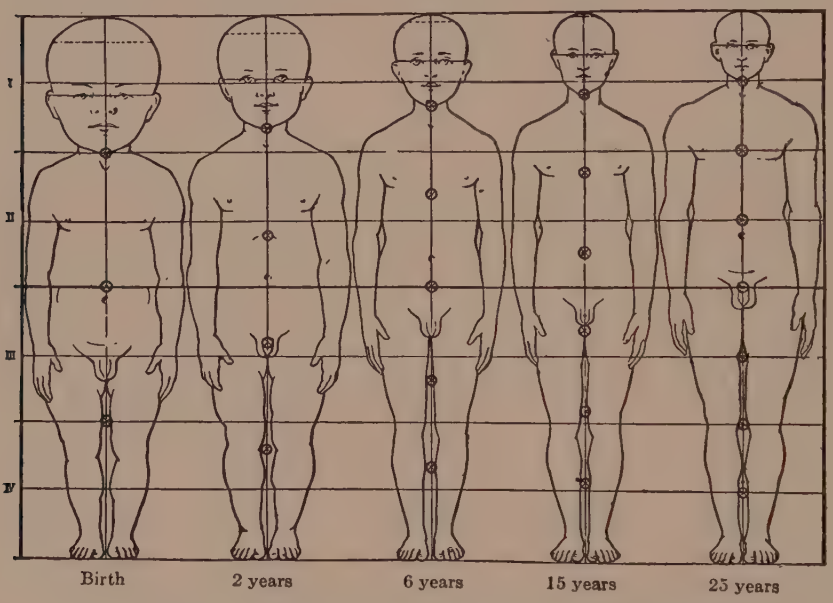


FIG. 3.—GROWTH: PROPORTIONS AT DIFFERENT AGE PERIODS (STRATZ).

The figures drawn to scale illustrate the proportions which exist between the head, trunk, and extremities at different ages.

The circumference of the head and chest is as follows (average measurements):

TABLE XIII

AVERAGE HEAD AND CHEST MEASUREMENTS TO TEN YEARS

AGE	CIRCUMFERENCE, INCHES	
	Head	Chest
Birth	13.7	13.2
6 months	16.8	16.3
1 year	17.8	17.8
2 years	18.7	18.7
4 years	19.6	20.7
10 years	20.9	25.2

The circumference of the head is larger at birth than the circumference of the chest. By the end of the first year and through the second the two measurements are practically the same. From this time on the measurement of the chest increases steadily over that of the head.

Chest measurement (circumference) in relation to height and weight is a most important ratio, as it takes into consideration the body type or habitus of the individual. Sufficient statistics are lacking as yet to construct satisfactory tables on this basis.

The abdomen of the normal child is relatively large and prominent during infancy. For the first 2 or 3 years it measures in circumference about the same as the chest. Then, as the young child grows taller and the baby fat is lost, the circumference becomes less than that of the chest.

But few of the other measurements can be said to have practical importance. The thymus gland is one of the few structures which decrease in absolute size and weight. The brain is proportionately large at birth and its increase is slight. From constituting about 12 per cent of the body weight at birth, it steadily loses this ratio, until, at the age of 14 to 15 years, it is only around 3.5 per cent of the weight of the body.

The marked acceleration in growth which takes place during the pubescent growth cycle involves many structures. Of particular importance are the increase in the size of the muscles and the size of the heart, and the development of the sex organs. These are of definite practical importance to the physician. The heart nearly doubles in size during this period and unless the cardiac development keeps pace with the general development there is danger of overstrain. The sex differentiation which takes place at this time brings many new physical and psychological problems.

Teeth.—There are quite marked variations in the time of eruption of the teeth. This is in large part dependent upon the nutrition of the infant, both the nutrition as a whole and the mineral metabolism. Below are given the approximate periods of eruption but variations beyond these figures may occur and the time of eruption of teeth be normal.

Deciduous Teeth	*Age of Eruption*
2 lower central incisors	6 to 8 months
4 upper incisors	8 to 12 months
2 lower lateral incisors	10 to 14 months
4 anterior molars	12 to 15 months
4 canines	18 to 24 months
4 posterior molars	24 to 30 months

Permanent Teeth	*Age of Eruption*
First molars	6 years
Incisors	7 to 8 years
Bicuspids	9 to 10 years
Canines	12 to 14 years
Second molars	12 to 15 years
Third molars	17 to 25 years

POSTURE

Posture is one of the most important subjects connected with the physical development of the child. No matter whether the internal organs be sound, the weight for height average, and the annual gain in weight and height satisfactory, the physical development of the child cannot be considered satisfactory if the posture is bad. The majority of adults have a poor posture as a result of neglect in childhood. Examination shows that approximately 75 per cent of adolescents show some degree of postural defect. It is difficult to define correct posture except by description. An individual with a good posture stands erect, with the chest high and the shoulders back and on an even level. The head is erect on the trunk and chin held back. The abdomen is flat and the abdominal muscles strong. The body inclines slightly forward from the hips. The knees are not sprung and the feet are parallel, both in standing and in walking. The entire attitude is one of poise and balance. The posture illustrations show graphically the differences between good and bad posture.

In incorrect posture we find one or many of the following defects or faults: Head forward with chin protruding, shoulders forward or rounded and of unequal level, shoulder blades unduly prominent or winged, chest flat with poor expansion, abdomen protruding

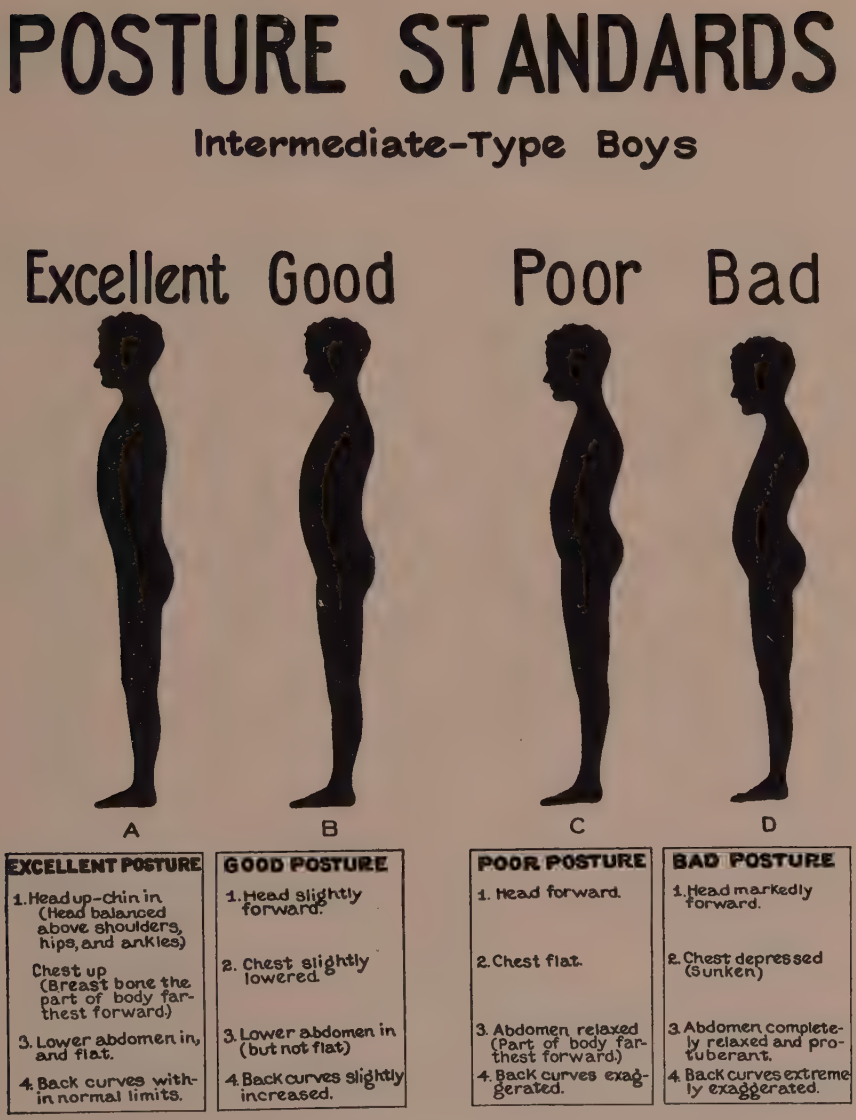


FIG. 4.—STANDARDS OF POSTURE FOR INTERMEDIATE TYPE BOYS. Similar standards are published for the thin and fat body types.

FIG. 5.—STANDARDS OF POSTURE FOR INTERMEDIATE TYPE GIRLS.
Wall charts similar to the above may be obtained through the Children's Bureau.

with relaxed muscles, exaggerated anteroposterior spinal curves and abnormal lateral curvatures, body held at wrong angle to hips, legs bowed or knock-kneed, knees sprung, feet flat or excessively pronated or supinated in standing and walking. No one is born or developed absolutely symmetrical and "poor posture" does not relate to these minor differences.

Not only has correct posture a distinct esthetic value which is psychologically important, but it is of tremendous importance in relation to health. Bad posture carries the body in an unnatural position, causing fatigue and overstrain of the muscles and ligaments. It cramps the chest, which results in poor expansion and lessens the pulmonary ventilation. The abdominal organs instead of being held in place sag down and the intestines become kinked, impeding the normal passage of fecal material. This results in costiveness and leads to the absorption of intestinal toxins. Hence fatigue, constipation, indigestion, and malnutrition are associated with postural defects. In girls poor posture leads to menstrual difficulties and may later on complicate childbirth. Not only does the posture have a decided influence upon the development of the child, but the uncorrected postural defects of childhood have serious consequences in adult life, for many of the cases of painful feet and back which lessen the happiness and impair the health of adults have their origin in the postural defects of childhood.

We must recognize the fact that certain inherited types of body habitus are prone to develop postural defects. The tall, thin, rapidly growing child with poor muscular tonus is apt to have a poor posture, and in considering the prevention of incorrect posture and the posture of the individual child the body type must be taken into consideration. Thus a certain degree of prominent scapulæ may be quite normal in one child and abnormal in another. Correct posture does not mean that all children should be built alike or appear alike in physical development.

Faulty posture may at times be congenital in origin or due to disease, but is usually the result of environmental causes. Rickets or infantile paralysis, visual defects, and obstructed breathing as a result of hypertrophy of the adenoids will lead to poor posture.

There is close relationship between incorrect posture and malnutrition, both as a cause and as an effect. When these conditions are associated with postural faults, specific treatment must be applied to the cause to prevent the establishment of severe permanent postural defects.

There are a number of environmental factors influencing posture to which attention must be given. Some of these may be traced back to infancy. Too early walking, or walking when the bones are soft as from rickets, is a common cause. Normally a child pulls himself along the floor at first, then creeps and later begins to rise and walk with the aid of chairs and other support. Walking is a natural process, and not infrequently it is helped too much by overinterested parents. When a child first begins to walk the muscles give way as soon as the slightest excess strain or fatigue takes place. The age of walking varies quite widely within normal limits. Overfat babies with excessive weight are particularly apt to develop poor posture. A baby of average weight with good tonus is far preferable to one of excessive weight with soft and flabby tissues, as is so often seen when the baby has been on a high carbohydrate diet, as condensed milk. Propping the baby up too early and maintaining a sitting posture before the trunk muscles are strong enough to maintain the infant in this position is likewise to be avoided.

As the child grows older the maintenance of improper positions in walking and sitting at home and at school are common causes of postural defects. Chairs and school seats are usually made to fit an age rather than the child and hence the same size seat or chair is made to fit children of vastly different sizes. The child cannot be blamed under these conditions if it assumes an abnormal cramped position. Many children fall into awkward positions in reading and this is particularly true of the sedentary child who avoids exercise and prefers to stay in and read. This is the type of child who needs play and exercise the most and who is particularly prone to develop a spinal curvature. Frequently the arms and legs are exercised sufficiently but insufficient exercise is given to the trunk and abdominal muscles which are most important in maintaining good posture.

Clothing may be a factor in the development of faulty posture but

this is not so important a cause as a generation ago. Improper or tight shoes are frequently at fault. Socks which are too small or shrunken may also force the foot into an unnatural position. Round constricting garters should not be used and children's underwaists should be made so that the pull of the attached garter should come from near the neck and not from the outer part of the shoulder. Heavy clothes are also bad—particularly heavy overcoats.

Some attribute considerable importance to the type of bed used for sleeping. The bed should have a firm, fairly hard mattress that does not "sink in." It is best never to use a pillow and children who have never used a pillow sleep better than those who have been accustomed to its use. The bed clothes should be warm but never heavy. Another cause of poor posture, particularly in growing children, is lack of sufficient relaxation during the day. Rest periods are essential to children.

The prevention of incorrect posture lies not only in the avoidance of the factors discussed above, but in the teaching of correct posture and its maintenance. A position of good posture may be obtained if the child is stood with the back against a smooth wall. The feet are placed parallel with the heels about two inches from the wall. The head and shoulders and hips are held firmly against the wall and then the attempt is made to flatten out the spine against the wall. In another exercise the feet are placed parallel and an effort is made to grip the floor with the toes; then the top of the head is pushed up as far as possible. Instructions to a child to "stand straight" or "keep the shoulders back," etc., are useless. In order for a child to have a good posture it is essential to have strong muscles and this requires exercise. Young children as a rule take poorly to formal exercise and it is not until about puberty, when there is a personal subjective interest in physical development, that children can be trusted to take exercises for physical development without supervision. Up to this time exercises must be taken with an older person. The best developed children are those who take daily morning exercises with their parents. These should be simple: deep breathing, using the abdominal muscles to pull up the legs and trunks, and bending and rotating exercises for the trunk muscles. If young children are taught to assume the posi-

tion against the wall, outlined above, and maintain it for 3 to 5 minutes two or three times a day it will be found of considerable help in obtaining correct posture. This is particularly true if from 5 to 10 minutes before the position is taken the child lies flat on its back on the floor with a small pillow under the shoulders. This gives a period of muscle relaxation with the body in a good posture followed by correct posture with muscles tense and active.

Postural faults, mechanical in origin, do not become fixed until around puberty. Before this time they are fairly easily corrected by appropriate exercises, bending, stretching, etc. The type of exercise for the correction of the fault varies of course with the type of fault and hence must be prescribed for the individual child. Where malnutrition is associated with incorrect posture there is a reciprocal reaction and the correction of either one helps in the handling of the other. The faulty posture of the malnourished child corrects itself to a certain degree and without special attention as soon as the nutritional condition improves.

CHAPTER IV

NUTRITION AND DIET

One of the most important phases of preventive pediatrics is the subject of nutrition and diet, as it is one of the factors influencing growth and development which is under our control. We are concerned only with the diet of the normal healthy infant and child and not with the diet of children with abnormal or pathological conditions or states of nutrition. A discussion of our scientific knowledge of metabolism, food values, composition, and the like is omitted, as such discussion is taken up in detail in another volume of this series of monographs. The important subject of habits as related to diet and nutrition is considered in Chapter V.

A food for an infant or child must meet certain requirements or needs. It must contain all of the various elements required for normal growth and repair—protein, fat, carbohydrate, mineral salts, vitamins, and water—in sufficient quantity to meet the need of each individual substance and in total quantity of the first three to furnish the calories necessary for the basal metabolism, growth, waste through excreta, and muscular activity. We can measure the requirements for basal metabolism and waste in a fairly accurate way. The amount required for muscular activity and growth is an individual factor, varying from time to time, and can only be approximately estimated for a given individual. In fact our "scientific knowledge" of the total amount required by an infant or child is based chiefly upon measurements of the amount of food taken by individual infants and children who have been developing in a normal way. It is the ordinary common experience of practice that one infant or child will need more food than another if the first is to gain and develop at the same rate as the second. The best proportion of protein, fat, and carbohydrate in a diet furthermore is not a matter of scientific knowledge. While in the optimum food for an infant—breast milk—the average ratio

of *fat* 3.50, *carbohydrates* 7.50, *protein* 1.25 is probably ideal, we know that this ratio may vary without any appreciative effects upon growth. Moreover, when cow's milk, the basis of nearly all artificial infant foods, is fed this same ratio does not hold and the relative percentage of protein must be at least twice as large as when breast milk is used.

As children grow older and the dietary increases there is a wide distribution of the percentage proportion of the various food elements.

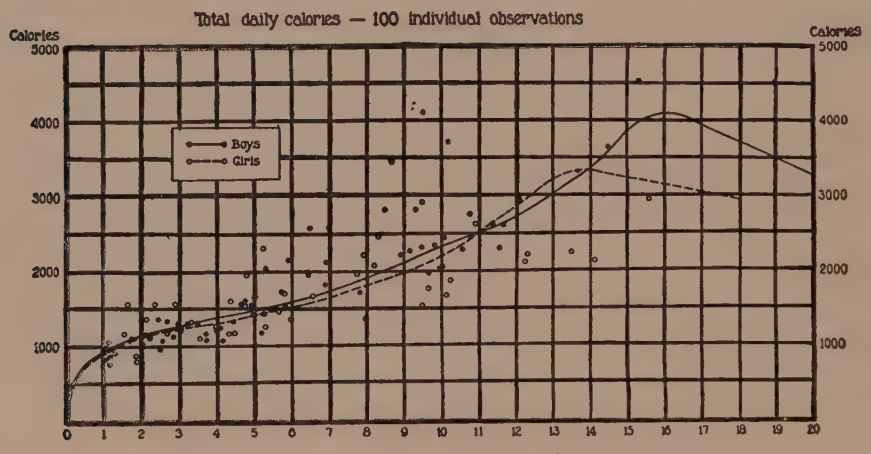


FIG. 6.—TOTAL DAILY INTAKE IN CALORIES BY AGE.

The dots represent individual observation on boys and the circles observation on girls. (From Holt, *Food, Health, and Growth;* courtesy of The Macmillan Co.)

It is essential that the ration be well balanced to meet the nutritional needs of the child. From both practical observation of the diet of healthy growing children and theoretical discussions it has been found that if fats furnish 35 per cent of the calories, proteins 15 per cent, and carbohydrates the remaining 50 per cent the diet is optimum for the nutritional needs. Quite wide variations from these figures are actually taken by individual healthy children and these figures can only be regarded as average.

The caloric requirements for children of different ages is shown graphically in the above figure prepared by L. Emmett Holt. The tremendous food intake during the pubescent period is of particular interest.

THE FEEDING OF THE INFANT

Breast Feeding.—Pediatrics has been overburdened with the subject of artificial infant feeding. Nature has provided an ideal food for the infant and the time and energy of the physician should be spent upon maintaining and conserving this supply rather than upon devising foods and formulæ for artificial feeding. The physician who works sincerely and earnestly at the problem of maternal nursing will save more lives than the most modern infant ward in a hospital under the charge of the most experienced pediatrician. Not only will he save lives, but in addition he will be instrumental in bringing up a race of strong, healthy children resistant to the diseases which children develop later in childhood. Despite the propaganda in recent years of the child hygiene movement for breast feeding, a propaganda which is just beginning to show its effect, we find that the majority of artificially fed infants have been taken off the breast *by their physicians* and that this is the beginning of the troubles which lead to the child passing from under the care of the family physician to that of the specialist. The explanation for this lies in the overemphasis which has been placed upon artificial feeding in our medical schools and the failure to teach thoroughly and emphasize the technic of breast feeding. Breast feeding is infinitely more simple to carry out than artificial feeding. The first requires only ordinary medical knowledge, while the latter not infrequently is a task requiring a large and long experience. Furthermore, the mothers of to-day have been educated to the value and importance of breast feeding and many mothers bring their babies to the specialist because they have been advised by their family physician to take the baby off the breast, and realize that this is wrong. In St. Louis approximately 80 per cent of the infants are breast fed, and in Minneapolis, where a special community effort was made by the University under the plan and direction of the late Dr. Sedgwick, it was established that it was possible to keep over 90 per cent of the infants on the breast for 3 months and 84 per cent for 6 months. If there is any one factor of dominating importance in preventive pediatrics it is to prevent the infant being taken off the breast and placed upon a substitute or artificial feeding.

From a theoretical standpoint let us take a thousand babies as a basis and an infant mortality rate of one hundred. A fair figure of division of the thousand babies will be 750 breast fed and 250 artificially fed. Mortality statistics show that for every death in a breast-fed child 5 deaths occur in artificially fed children. The hundred deaths will therefore be divided according to nature of feeding into 17 breast fed and 83 artificially fed. As three-quarters of the infants were breast fed and only one-fourth artificially fed the infant mortality rate for the breast fed works out to 23 and the rate for artificially fed to 332. Nothing stronger could be stated to urge and emphasize the importance of breast feeding.

As will be pointed out in a later section the larger part of the infant deaths occur in the early months. Moreover, we know by experience that in actual practice many of the deaths in the latter part of the first year have an underlying basis in a badly nourished infant with lowered resistance to infection. Hence it is the period of early infancy which is most important. If the baby can be brought through the first 2 or 3 months of life on the breast and without any nutritional disturbance or upset, the task of infant feeding is relatively simple. Every possible effort should be made to keep the baby on the breast during this early period, even if it is necessary to begin to complement the feedings during the first few weeks and the larger part of its food be artificial by the second or third month. A few ounces of breast milk a day maintained to the third or fourth month will give the baby an intangible something that cannot be wholly supplied by the most satisfactory milk formula devised. The simple fact that the breast milk has diminished to less than half of the baby's daily requirements is not in itself a sufficient reason for taking the baby off the breast.

Technic.—Success in breast feeding is largely a matter of technic which may be summed up as the regular and complete emptying of the breast. Failure depends upon one of two factors—underfeeding or overfeeding. Difficulties which arise, so far as the breast milk is concerned, are practically always quantitative. Qualitative faults are so extremely rare that they may be disregarded. Despite this, in nearly ninety-nine out of one hundred cases the reason given the mother for

taking the child off the breast is that "the breast milk disagrees." The technic of breast feeding may be discussed under four heads:

1. The mother
2. Regularity of feeding
3. Underfeeding
4. Overfeeding

The Mother.—Contrary to the opinion frequently heard expressed the number of mothers who do not desire to nurse their babies is insignificant. There is no question on the other hand but that many women to-day find the task irksome after a few months. Even in instances where the physician senses that the mother has made up her mind she will not nurse the baby, the assumption at the outset that she intends to nurse the baby and a plain statement of the necessity for breast feeding and the danger of artificial feeding will usually deter the mother from the ultimatum she intends to deliver in regard to the subject. Thus the infant will be kept at the breast for 2 or 3 months, the most important period, as has been pointed out, and the baby will get a good start in life. Even women who have had one or two babies raised on the bottle will often nurse a third or subsequent child.

Probably the most important factor is the mental attitude of the mother. The education of the mother must begin long before the child is born and it is here that the interrelation of the specialists—the obstetrician and the pediatrist—often falls down. The family physician who handles both the pregnancy and the infant has a much better opportunity to control this factor or element.

One practical consideration frequently encountered is the fear of the woman of to-day of becoming fat if she nurses her baby. This is the result of an unfortunate "stuffing" on the part of many women in an attempt to increase the quantity of milk. Although the author knows of no statistics regarding the point it is quite the universal experience that thin women are apt to have a more bountiful supply of milk than fat women, perhaps because they are more active and in better health as a rule. The diet of the nursing mother should be plain, simple and wholesome, and in quantity only sufficient to maintain her

own nutrition and in addition to supply from 300 to 700 extra calories for the infant, according to its age. There is no one food or article of diet which experience has shown influences directly the quantity of milk. Frequently a woman who does not ordinarily use milk will start taking large quantities in the erroneous expectation that the cow's milk will be transformed into breast milk, with the usual result of its having no effect except to increase the mother's weight. If the mother uses milk in her usual diet the quantity may be increased, or a small quantity added if she is not accustomed to its use. Articles of food which have been known to disagree should be carefully avoided. It is most important that the fluid intake—water—should be increased and this factor is frequently disregarded while the mother is stuffing far beyond her needs.

Another point of equal importance is the subject of exercise and fatigue. The first is an essential for the nursing mother. Fatigue is more likely to be the result of unfortunate home or environmental influences, as worry, sickness, etc., than the result of overexercise on the part of the nursing mother. Fatigue with its unfavorable mental reaction is one of the dominating factors where the supply of mother's milk is insufficient.

Regularity of Nursing.—The secretion of breast milk depends upon the routine emptying of the breast. While the original secretion is in all probability dependent upon some endocrine or hormone relationship connected with parturition, the continued secretion is in large part dependent upon the act of sucking by the baby and the emptying of the breast; in other words, it is a physiological response to a demand.

Experience, from which we have learned most that we know of nursing, has taught us that the baby should be put at the breast once in the first 24 hours, 2 or 3 times in the second, and then on a regular 3- or 4-hour schedule depending upon our decision of intervals in regard to the individual baby in question. It is hardly necessary to state that the feedings should be at regular intervals or that they should never be more frequent than 3 hours apart. To adopt and insist upon a routine 3- or 4-hour interval for every baby is an example of somewhat stupid obstinacy. If the baby is a strong, vigorous baby weigh-

ing 8 pounds or over and the mother a healthy woman from whom we may expect an abundant supply of milk, a 4-hour schedule—6 A.M., 10 A.M., 2 P.M., 6 P.M., 10 P.M.—is usually most satisfactory. If, however, we have a small baby who does not nurse vigorously and the breasts are emptied with difficulty, a 3-hour schedule—6 A.M., 9 A.M., 12 A.M., 3 P.M., 6 P.M., 10 and 2 or 10 P.M.—is almost necessary, as the baby not only obtains more food but the breasts are emptied more frequently and hence the secretion of milk is stimulated. For the baby between the two extremes the two factors must be weighed in each individual case: the nursing strength of the baby and the abundance of the supply of mother's milk. If, after a short time, the secretion of milk becomes abundant and the baby's strength and weight increase rapidly a change from a 3- to a 4-hour interval may be made. From its effect upon the mother's daily routine, her happiness, and pleasure, a 4-hour interval is preferable. It gives a minimum of interference with her meals, household duties, and social activities. The evening feeding may be at 10 or 11 P.M., or even later, with a normal healthy baby, thus allowing of evening pleasure or evening relaxation outside the house.

Although the 20-minute nursing period may almost be termed classical, recent careful studies have shown that it rarely requires more than 10 or 12 minutes to empty a breast and that the baby obtains most of the milk in the first 5 minutes. Certainly 12 minutes is sufficient in the vast majority of instances. Nursing after the breast is empty leads to air swallowing and distress on the part of the baby and may cause a soreness of the nipples.

Underfeeding.—Most of our difficulties in breast feeding arise from an insufficient quantity of breast milk. While we are apt to attribute this to some inherent defect or inability of the mother to secrete milk, the experience of recent years has shown that the fault is more apt to lie in the failure to stimulate the secretion through incomplete emptying of the breast. The most frequent condition which is encountered is the weak and premature baby who does not have sufficient strength to nurse properly and who tires of the nursing before sufficient milk has been obtained. As milk is left in the breast at each nursing the stimulus to secretion is lessened. As a result the

quantity of milk gradually decreases. A less common difficulty is a tight spastic circular muscle of the nipple which makes it hard for even a strong baby to obtain the full quantity of milk before becoming tired. The third condition is when the secretion is actually insufficient for some reason connected with the mother's metabolism.

There are a number of simple measures which may be taken to increase the quantity of milk secretion. If we start nursing the baby on alternate breasts every 4 hours we can change the frequency of nursing to 3 hours. Thus each breast is emptied at 6-hour intervals rather than at 8. Or, if we find that the quantity of milk on a 3-hour alternate schedule is insufficient in quantity, the baby may be nursed for 8 to 10 minutes from each breast every 4 hours, insuring a stimulus to each breast at least 5 times in the 24 hours. The next step is to nurse each breast every 3 hours. A simple change of this type will frequently lead to a decided increase in quantity and in time a readjustment to a less frequent or former schedule may be made as the infant grows stronger and nurses more vigorously, and when, as usually happens, the quantity of breast milk increases.

If it is found that the breasts are not completely emptied when the infant stops nursing, some mechanical means may be used to finish the act. In the past a mechanical pump of some type has been most frequently used for this purpose, but at present manual expression of the milk is the favored plan. Numerous descriptions of the technic have been published which differ slightly. What one really tries to bring about is the drawing out of the milk from the ducts by a method of manual sucking similar to that used in milking a cow. The breast is held with the fingers of the hand below and the thumb above. The thumb and first finger are about one inch from the nipple or almost at the margin of the areola. Deep, firm pressure is then made backward, grasping the tissues of the breast, and then the breast compressed and at the same time drawn slightly out. This cycle of "deep," "together," "out," may be repeated 50 times per minute and requires but little practice to be done properly. If the expression is done properly the milk should flow in quite a steady stream. The milk may be collected in a sterile (boiled) tumbler and used as a complemental feeding if necessary.

The only way really to determine how much breast milk the child is obtaining is to weigh the baby before and after each feeding and then compute the 24-hour total. This can be carried to excess and frequently young or new mothers in some of our maternity services become so anxious and worried over the amount the baby obtains each time that the psychical effect is bad. The amount obtained at different feedings varies considerably and a small amount at some one feeding will cause the mother anxiety. Routine weighing before and after nursing should never be carried out day after day. The baby gains or fails to gain on a 24-hour quantity and not on the quantity of each individual nursing. If the baby does not gain satisfactorily the interval may be rearranged as suggested above, or if the baby fails to empty the breast because of a spastic muscle or weakness on the part of the baby, manual expression after each nursing will empty the breast and increase the quantity of milk until the spasticity gives way or the baby gains in strength sufficiently to empty the breast.

Overfeeding.—The clinical picture of overfeeding is all too common. In the vast majority of cases it is due to nursing too frequently and at irregular intervals. In the mildest form and at first the baby simply regurgitates the excess food and gains rapidly and steadily. To this the picture of abdominal distress is added and the baby becomes fretful, restless, and cries from pain. Then almost without exception the mother decides the baby is hungry and nurses again. The cycle becomes aggravated and the infant's balance is upset and it fails to gain. This is attributed to a faulty *quality* of the milk and then, too often on the advice of the doctor, the baby is put on an artificial formula. The prevention of overfeeding is the simplest. If the baby has been nursing from both breasts on a 2- or 3-hour schedule, let the baby alternate the breasts each feeding every 3 or 4 hours as the individual case may be. Make the mother understand that for a few days the baby will continue to fuss but that fretfulness is not due to hunger. Picture to the mother her own reactions from overstuffing. This is the simplest way to make the anxious mother understand how the difficulty can be corrected by lengthening out the interval of feeding.

Contra-indications for Nursing.—The only absolute contra-indication for nursing is open tuberculosis of the mother. This for the sake of both the infant and the mother. Not only should the baby not nurse but it should be removed from contact with the mother. Latent tuberculosis requires a nicety of judgment. No rule can be established and each case forms an individual problem. Conservatism should be the rule. Not infrequently a mother with latent tuberculosis will have and nurse a baby without the slightest injury to her health. The family circumstances are an important factor in latent tuberculosis, as it must be possible to protect the mother in every way. Judgment must be used in each individual case. Malignancy may or may not be a cause for not nursing the baby. Insanity must be considered as an individual case problem. There is nothing in the milk of an insane mother which will harm or cause insanity in the child. Syphilis, as will be discussed later, is a decided reason for nursing. Cachectic diseases, as severe enemia or nephritis, are frequently reasons for putting the baby on the bottle, as they may seriously interfere with the recovery and physical condition of the mother. Fortunately these problems are not very common.

Congenital malformations, especially harelip associated with cleft palate, may prevent the baby nursing for mechanical reasons. A simple harelip may be repaired early and the breast milk maintained by manual expression until the baby is able to nurse. The simple mechanical device devised by Foote is of considerable aid.

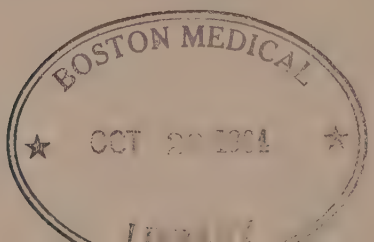
Addition of Other Foodstuffs.—How long should the infant be continued at the breast? Three months is essential, 6 months desirable, 9 months sufficient, 12 months too long. Even if the baby is thriving on the breast milk it is essential that some other food be given during the period of nursing. Infants nursed too long on breast milk alone show a certain deterioration which becomes quite obvious as a rule about the eighth or ninth month. It is probably the result of a salt and vitamin deficit. Moreover, the change from the breast milk to other types of food is frequently difficult after the eighth month if the baby has been exclusively breast fed. There is an important "habit phase" in this connection. Breast-fed infants will thrive better if some additional food is given beginning with the fifth month. It

has been found in practice that a tablespoonful of thoroughly cooked cream of wheat or farina, thinned out with one or two ounces of boiled whole milk, is a satisfactory addition. This is fed with a spoon and then the baby is nursed. This is given daily with the 10 A.M. feeding (by this time the baby should be on a 4-hour schedule) and after a couple of weeks the same addition is given with the 6 A.M. feeding. The cereal is not strained and the quantity is gradually increased until 3 or 4 tablespoonfuls with 6 or 8 ounces of milk are being taken at the eighth or ninth month. At this time the type of cereal should be changed and the variety increased (see Habits, Chapter V). Unmilled cereals should be introduced by the eighth month. In addition to the cereal some form of green vegetable should be added by the sixth month. Naturally the kind must be dependent somewhat upon the season and variety in the market. Spinach is perhaps the best. This should be cooked in its own water by steaming and the vegetable then put through a fine-mesh sieve and given at the 2 P.M. feeding. Starting the vegetable 2 or 3 times a week it should be given irrespective of a normal regular gain on breast milk alone.

Complemental Feeding.—Despite all our efforts we not infrequently find that the infant will not thrive in a satisfactory manner on the breast alone. The rate of gain falls below the rate outlined in Chapter III. Actual measurement of the quantity obtained by weighing the baby before and after each feeding will show the quantity insufficient in total quantity in the 24-hour period. Sometimes the fractional quantity will be sufficient in the first 2 feedings but not in the subsequent ones during the day. This occurs despite the attempts made to increase the quantity of breast milk outlined above. In this situation it is necessary to eke out the supply of breast milk. For this purpose almost any type of artificial infant food may be used. As this not infrequently is indicative of complete artificial feeding in the near future it is wise to use cow's milk as the complemental food, so that a second change will not be required if complete artificial feeding becomes necessary. In this way the infant can be gradually changed from mother's to cow's milk without an upset or halt in the weight curve. As has been pointed out, the maintenance of the breast milk depends upon the regularity and frequency of emptying the

breast; hence if the breast milk is decreasing the artificial feeding should never be substituted at one time for a nursing but each nursing should be helped out by giving a bottle after the breast nursing. To substitute a feeding is the quickest way to bring about a decrease in the quantity of breast milk and is the method of weaning. Our records show many instances where it has been necessary to complement the diet early in infancy for a few weeks and later it has been possible to return to exclusive breast nursing. It will frequently quiet the worrying of a young, anxious mother whose baby fails to gain at the average rate. When her worry is allayed the breast milk increases. Sometimes it is wise to continue a small complemental feeding, without increasing the strength of the mixture or the quantity given, as the mother attributes the gain to the extra food, although in reality it is due to the increased supply of breast milk. Stopping the complemental feeding starts the worry all over again with its consequential effect upon the supply secreted. For young babies under six weeks a simple formula of 5 oz. milk, 5 of water, and ½ oz. of sugar, boiled, is satisfactory and is easily increased if necessary. It is much simpler and preferable simply to direct, "as much of 2 ounces as the baby will take of this *after nursing*," rather than attempt the time-consuming, worrying method of weighing before and after each feeding, and then complementing up to a certain quantity. If the baby fails to gain, it requires more, and even if this quantity is not required it is not too strong or too much to upset the infant. A full week or ten days' trial should be made of the small quantity, for with young babies in particular the breast milk will usually start to increase after a few days of satisfying the hunger of the baby and the worry of the mother.

Supplemental Feeding and Weaning.—If the infant has been fed as outlined above it will have become accustomed gradually to foods other than its mother's milk. Weaning then becomes the simple matter of the gradual increase of the additional food and the decrease of breast milk in the diet. The quantity of cow's milk is increased to 8 ounces at the 10 A.M. and 6 P.M. feedings and these two nursings stopped. Milk is then added to the 2 P.M. feeding until 7 or 8 ounces are being taken and only a morning nursing or a night and



morning nursing given. In a very short time the breast milk will show a rapid decrease and then a quart of milk is distributed in 4 or 5 feedings throughout the day at 4-hour intervals. We have become convinced that the baby weaned at 8 months as a rule does best, and that nothing is to be gained by continuing the breast milk longer. We continue it longer only when the supply is abundant and the eighth or ninth month falls in midsummer. When it is necessary to complement earlier it is advisable to wean earlier—at any time after the third month when the quantity of breast milk falls under six or eight ounces a day. Until the end of the third month even this quantity should be kept up as it is of distinct value and importance in maintaining the general nutrition of the baby and insuring its optimum development.

Artificial Feeding.—As stated above, with proper technic it is possible to keep from 75 to 90 per cent of the infants upon the breast for at least the first 3 or 4 months—the essential months. For one reason or another it becomes necessary to give a certain number of infants an artificial food. Entirely too much time, work, and teaching has been and is being spent in our medical schools on the subject of artificial infant feeding. Pseudoscience and misdirected aims have dominated this field in the past in the attempt to imitate breast milk. The methods of the past are entirely too impractical for either physicians or mothers. What was known as "scientific infant feeding" is found under careful scrutiny to have little "science" in it. The difficulties and impracticability of percentage and top-milk formulæ are the chief factors which have led physicians to give up in disgust and turn to patented and proprietary infant foods *with directions for feeding the baby given by the manufacturers.* There has been a decided tendency in the last ten years to teach simple directions which are practical, and which those of us who have tried both methods know to give equal if not better results; moreover, they do not require the skill and practice of a specialist for their use, but can be used and are used by the general practitioner under whose care come the vast majority of infants. This is not a text on infant feeding and hence only the facts and not the knowledge and work upon which these facts depend will be discussed.

Our figures show that of the artificially fed infants some 75 per cent or more will thrive on ordinary, diluted cow's milk, if given in proper strength and quantity. The vast majority of the remainder will thrive on simple modifications of milk. We have learned that when a baby who is being fed in these ways does not thrive, it is not as a rule due to the milk formula, but the result of some other cause, most commonly some infection, and that the nutritional condition is secondary. It is of course essential that the milk be pure. Where the pure milk is not obtainable, the dried milk powders may be used. Regardless of whether the milk is "certified," pasteurized, or raw, it is a wise precaution to order *all* milk given to a baby under one year to be boiled. We no longer rely upon the vitamins in milk, even if it is given raw, and boiling milk is the only sure way to avoid contaminated milk as a source of acute intestinal infection. There has been a marked decrease in "diarrheal disease" in St. Louis following a standing order in the infant welfare stations that all milk for infants must be boiled. ("It should be brought rapidly to a boil and held at boiling 2 to 3 minutes.") When the end of the first year falls in the hot period of the year the milk should continue to be boiled until cool weather, up to the fourteenth or sixteenth month as the case may be. Then only "certified" or "Grade A" pasteurized milk is given without boiling. It goes without saying that the milk after boiling must be kept cool and free from contamination.

In determining the quantity of food to be given there are two points which must be observed. First, it must be sufficient in quantity to meet the total caloric requirements of the infant and, secondly, it must contain at least minimum amounts of the individual protein, salt, and vitamin quantities needed. The total caloric requirement varies in different infants and there is no exact way of determining the amount for each individual except as the infant gains in a satisfactory manner. By measuring the food intake in thriving infants it has been found that the average normal infant will develop in a satisfactory way if approximately 50 calories are given for each pound of body weight in the early months, gradually decreasing to approximately 40 calories at the end of the first year (Illustrative Formulæ I and II should be read in connection with the text that follows).

Illustration I

Baby 2 months, weight 9 pounds

Total requirement in calories (9 x 50) . . . 450 (approximate)
Protein requirement (1½-2 x 9) . . . . . 14 to 18 ounces milk
Calories in 16 ounces (16 x 20) 320
Additional carbohydrate (1 ounce sugar) 120
440
Total quantity (6 feedings, 4 ounces each) 24 ounces
Formula: milk 16 ounces, sugar 1 ounce, water 8 ounces.

Illustration II

Baby 5 months, weight 14 pounds

Total requirement in calories (14 x 45) . . 630 (approximate)
Protein requirement (1½-2 x 14) . . . . . 21 to 28 ounces milk
Calories in 25 ounces 500
Additional carbohydrate (1 ounce sugar) 120
620

or

Calories in 22 ounces 440
Additional carbohydrate (1½ ounces sugar) 180
620
Total quantity (5 feedings, 7 ounces each) . . . . . 35 ounces
Formula: milk 25 ounces, sugar 1 ounce, water 10 ounces; or milk 22 ounces, sugar 1½ ounces, water 13 ounces.

Infants below average weight for age require more calories per pound of body weight. It is likewise known that when a normal infant is on cow's milk the protein requirements will be met if between 1½ and 2 ounces of milk are given for each pound of body weight. This quantity will also supply the fat requirements. If the needs of these two are met in such a manner the remainder of the

total calories may be built up from the easily digestible and utilized carbohydrate (usually sugar). The vitamin requirements must be met by the addition of orange or tomato juice and cod-liver oil. A dilution of the food is necessary, in the early months at least, but is not so essential as formerly believed, as infants will take quite concentrated food. The total quantity of fluid required in the 24 hours is from 18 to 20 ounces in a young infant up to 35 or 40 at the end of a year. The quantity depends somewhat upon the time of the year, more being required in the summer months. These are the essential facts in outlining a food. It is the absolute quantity of food and not the percentage composition which counts, provided individual needs are taken care of in the total quantity. This quantity must be divided up and given at 3- or 4-hour intervals. The quantity to be given at any one time cannot be measured by studying gastric capacity post-mortem, as the water passes rapidly from the stomach and a much greater quantity can be taken at a feeding than the stomach will hold. It is a useful rule of thumb, learned from experience, that the age of the infant in months plus 2 gives a working basis for the number of ounces to be given at a time. It is rarely necessary to increase the quantity more than once a month or the total quantity of fluid over 8 ounces (6 months) at a feeding. As a general rule a 4-hour interval is best for a normal baby, except in the early months. An underweight baby may have to be fed more often.

The proof of the adequacy of the formula lies in whether or not the infant gains. If there is much activity and the baby fails to gain in a satisfactory manner the formula must be strengthened by adding milk up to 2 ounces per pound or by increasing the carbohydrate (sugar). When the baby is 2 or 3 months old the water may be replaced by barley water as a diluent. At 5 months, cereal should be added and at 6 months, vegetables, as described for the breast-fed infant. Milk from the formula should be used to thin out the cereal and the remainder of the bottle given after the spoon feeding.

In a small percentage of normal infants cow's milk is not well tolerated and better results will be obtained if the milk is acidulated. This may be done by sterilizing the milk and adding a culture of lactic acid bacilli, or bacillus acidophilus, or by adding dilute lactic or hydro-

chloric acid to sweet milk. The "acid milk" may be continued over months. Acidified milks are particularly indicated for underweight or malnourished babies but are only occasionally required for normal babies. They are better tolerated than sweet milk when given in a more concentrated form, a requisite for feeding the malnourished. Considerable stress is placed by some upon the kind of sugar used in making up the formula. In a normal baby this is not so important and we are not discussing infant feeding in general. Cane sugar, milk sugar, or one of the two forms of combination of dextrin and malt sugar on the market, the powdered or the dry, may be used. The author as a rule uses a dextrimaltose combination. "Infant foods" are best avoided and are never necessary for a normal baby. Condensed milks are objectionable, as they tend to make weight rather than strength. On certain occasions, as traveling, they may be used for short periods of time but never as a routine diet.

Diet in Late Infancy.—At somewhere about the ninth or tenth month we reach a point where the breast-fed baby is weaned and is taking the same diet as the artificially fed infant. It consists of 5 feedings as a rule at 4-hour intervals beginning at 6 A.M. Occasionally a breast-fed baby will sleep from 6 P.M. to 6 A.M. and thrive on 4 feedings. The diet consists of a quart of milk with 1 to 1½ ounces of sugar, somewhat diluted with water so as to make 7 or 8 ounces at a feeding, cereal twice a day, vegetables once a day, fruit juice, and cod-liver oil. From this time on to the fourteenth or sixteenth month when a change is made to 3 meals a day, the food is gradually increased both in quantity and variety. The cereal should be changed at least every other day and a variety of cereals used, as oatmeal, farina, Ralston, Wheatena, Pettijohn, and corn meal mush. They should be largely of the unmilled variety and after the twelfth month whole cracked wheat or other grains, natural and polished rice, wild rice, hominy grits, and any of the coarse cooked cereals on the market may be included to give variety. Variety is essential for the development of proper food habits. The cereals should be unstrained but thoroughly cooked. Most of them require 30 minutes over a flame or 2 to 3 hours in a double boiler. If whole grain cereals are used it requires from 2 to 3 times as long.

The variety of vegetables used should likewise be increased to include spinach, carrots, string beans, asparagus tips, cauliflower tops, Swiss chard, beet tops, peas (in smaller quantity), cabbage and lettuce. The vegetable is given in the form of a pulp, after cooking by steaming with a minimum amount of water and mashing through a sieve. As the baby grows older the pulp should gradually be made more coarse. It is sometimes taken better if a few teaspoonfuls of finely grated bread crumbs are mixed with the vegetables. After the eighth month a vegetable soup may be substituted a couple of times a week. This is best made by putting some small pieces of lean meat into a stewpan together with odds and ends of vegetables, potato peelings, etc., and allowing these ingredients to cook slowly together for an hour or two until about 4 ounces of liquid can be drained off. To this liquid is added 4 ounces of milk, one half teaspoonful each of butter and flour, a pinch of salt, and 3 or 4 tablespoonfuls of vegetable pulp prepared as if to be given by itself. This is boiled until the flour is cooked. When the soup is given only a few ounces of milk are given after the feeding.

At about 10 months the yolk of an egg is given, starting twice a week and increasing gradually to daily at 12 months. The yolk may be soft-boiled and fed with a spoon or the egg boiled very hard and the yolk grated up finely and mixed with the cereal or vegetable. At about 14 months the whole of the egg may be started. Small amounts are given every other day increasing to a whole egg 3 times a week by the sixteenth month. The yolk should be continued daily. Beef juice, an ounce, is prepared by squeezing small pieces from a small slice of round or rump steak which has been slightly broiled. This may be soaked up with stale bread and given with the 2 P.M. feeding twice a week after the tenth month. It has little food value. It should be given on alternate days with the egg.

At about twelve months a small quantity of stewed fruit, apple (apple sauce), or prune pulp may be added to the 6 P.M. feeding. At the same time a small strip of thoroughly cooked, crisp bacon is added to the 10 A.M. feeding.

After the eruption of the first 4 teeth a small piece of dry toast or zwieback may occasionally be offered for the baby to bite upon.

After 12 months the evening cereal may be occasionally replaced with starch in the form of potato and boiled macaroni. The potatoes should be old and baked, or thoroughly boiled and creamed with a little milk. Potato should never be used to replace the green vegetable.

Three Meals a Day.—The diet outlined above should be continued until the fifteenth or sixteenth month, at which time it is usually advantageous to change to a schedule of 3 meals a day: breakfast at 7 or 8; lunch at 12 to 12:30; supper 5:30 to 6.

Until the second year it may be desirable to give the morning bottle of milk at 6 A.M. and breakfast at 8:30 without the milk. A sample schedule for the days is as follows:

Breakfast

Milk, 8 ounces

Cereal, 3 or 4 tablespoonfuls, 1 to 2 ounces of milk and 1 teaspoonful sugar (Cereals same as for younger child mentioned above.)

Bacon, 1 slice

or

Egg, soft boiled or coddled

Toast or zwieback, small portion with butter

Midmorning

Juice, ½ orange

Dinner

Milk, 8 ounces

Vegetable soup

or

Green vegetable: large portion, any green vegetable except cucumbers (Turnips, thoroughly cooked cabbage, and rutabaga may be given.)

Starch: potato with butter or beef juice, or rice, macaroni, and spaghetti.

Simple dessert (Gelatine, junket, blancmange, or rice pudding may be given instead of starch with meal.)

Midafternoon

Graham crackers or zwieback

Supper

Milk, 8 ounces
Cereal or milk toast
Stewed fruit: apples or prunes, baked apple
Bread and butter

A pint and a half of milk is given to drink in three portions during the day. Not over a quart should be given daily, as when more is taken it is apt to take away the desire for other essential foods. The remaining half pint is used on cereal and in preparing soup, desserts, etc. It is essential that a wide variety of vegetables and cereals be used so that the child does not become attached too strongly to any one food (see Chapter V on Food Habits).

As the child grows older larger portions may be given and a greater variety of stewed fruits allowed with the supper. At about 20 months meat may be added to the midday dinner. One or two teaspoonfuls may be given 2 or 3 times a week in addition to the usual meal. Egg and meat are not given at the same meal. At first fine scrapings of beef, lamb, or chicken are shaped into a pat and slightly broiled on a hot dry spider. Later on these same meats may be served finely minced or chopped instead of scraped.

THE DIET OF THE OLDER CHILD

Diet from Two to Six Years.—The diet from 2 to 6 years should consist of gradual increase in quantity and variety until at school age the regular family diet is being taken. At 3 years fresh fish may be added and the variety of desserts may be increased. At 4 a few of the raw fruits. Care must be exercised to see that the fruits are ripe but not overripe. Melons should never be given. A child may be given as much as he wants at a meal provided that the portion of all is taken and the diet does not consist of some one food. Appended is a "week of meals for children from 2 to 6" prepared by a committee of dietitians and physicians for the American Child Health Association, and published by them in their booklet, "The Child in the House of Health." They indicate the type and character of appropriate meals at this age.

A Week of Meals for Children from Two to Six Years

MONDAY

(For Children from Three to Six Years)

Breakfast	*Dinner*	*Supper*
Orange	Cream of potato soup	Cream of spinach soup
Farina with milk	Coddled eggs	Pettijohn's food and milk
Bread and butter	String beans	Whole wheat bread and butter
Cup of milk	Bread and butter	Cup of milk
	Cup of milk	
	Junket	

(Modified for Children of Two Years)

Orange juice	Cream of potato soup	Pettijohn's food and milk
Farina with milk	Coddled eggs	Whole wheat bread and butter
Bread and butter	String beans	Cup of milk
Cup of milk	Bread and butter	
	Cup of milk	
	Stewed fruit	

TUESDAY

(For Children from Three to Six Years)

Breakfast	*Dinner*	*Supper*
Apple sauce	Spinach	Cracked wheat with milk
Rolled oats with milk	Boiled macaroni and tomato	Toast or crackers with butter and jelly
Toast and butter	Heart of lamb chop	Cup of milk
Cup of milk	Bread and butter	Cup custard
	Cup of milk	
	Stewed fruit	

(Modified for Children of Two Years)

Apple sauce	Spinach	Cracked wheat with milk
Rolled oats with milk	Boiled macaroni and tomato	Toast or crackers with butter and jelly
Toast and butter	Heart of lamb chop	Cup of milk
Cup of milk	Bread and butter	Cup custard
	Cup of milk	
	Stewed fruit	

WEDNESDAY

(For Children from Three to Six Years)

Breakfast	*Dinner*	*Supper*
Orange	Lamb stew with vegetables (carrots and potatoes)	Poached egg
Pettijohn's food and milk		Boiled rice with milk
2 slices crisp bacon	Toast or twice-baked bread and butter	Baked apple
Toast and butter		Cup of milk
Cup of milk	Cup of milk	
	Tapioca pudding	

(Modified for Children of Two Years)

Orange juice	Creamed toast and egg	Boiled rice with milk
Pettijohn's food, milk		Bread and butter
1 slice crisp bacon	Mashed potatoes	Baked apple
Toast and butter	Carrots mashed through sieve	Cup of milk
Cup of milk	Cup of milk	
	Toast or twice-baked bread and butter	
	Tapioca pudding	

THURSDAY

(For Children from Three to Six Years)

Breakfast	*Dinner*	*Supper*
Stewed prunes	Scrambled egg	Cream of pea soup
Corn meal mush and milk	Baked potato	Wheatena and milk
	Creamed cabbage	Graham bread toast and butter
Bread and butter	Bread and butter	
Cup of milk	Chocolate blancmange	Stewed fresh or dried peaches
	Cup of milk	

(Modified for Children of Two Years)

Prunes mashed	Scrambled egg	Wheatena and milk
Corn meal mush and milk	Baked potato	Graham bread toast and butter
	Creamed cabbage	
Bread and butter	Bread and butter	Cup of milk
Cup of milk	Chocolate blancmange	Stewed fresh or dried peaches
	Cup of milk	

FRIDAY

(For Children from Three to Six Years)

Breakfast	*Dinner*	*Supper*
Orange	Baked halibut	Farina and milk
Rolled oats and milk	Boiled potatoes with skins on	Soft boiled egg
Toast and butter	Swiss chard	Buttered toast and homemade jelly
Warm milk	Beets	Cup of milk
	Bread and butter	
	Cup of milk	
	Floating island	

(Modified for Children of Two Years)

Orange juice	Baked halibut (small amount)	Farina and milk
Rolled oats and milk	Mashed potato	Buttered toast
Toast and butter	Swiss chard	Cup of milk
	Beets chopped very fine	
	Bread and butter	
	Cup of milk	
	Floating island	

SATURDAY

(For Children from Three to Six Years)

Breakfast	*Dinner*	*Supper*
Fresh fruit, sliced	Roast beef	Boiled rice with milk
Farina and milk	Creamed potatoes	Toast with butter
Bread and butter	Chopped spinach	Cup of milk
Cup of milk	Bread and butter	Apple sauce
	Junket	

(Modified for Children of Two Years)

Fresh fruit, sliced	1 tablespoon minced roast beef	Boiled rice with milk
Farina and milk	Mashed potatoes in cream sauce	Toast with butter
Bread and butter	Chopped spinach	Cup of milk
Cup of milk	Bread and butter	Apple sauce
	Junket	

SUNDAY

(For Children from Three to Six Years)

Breakfast	*Dinner*	*Supper*
Orange	Fricassee of chicken	Bread and milk
Rolled oats and milk	Creamed green peas	Graham bread toast and butter
2 slices crisp bacon	Mashed potatoes	Cup of milk
Egg, poached on toast	Bread and butter	Stewed prunes
Cup of milk	Homemade ice cream (not too sweet)	

(Modified for Children of Two Years)

Orange juice	1 tablespoon of minced white meat of chicken	Bread and milk
Rolled oats and milk		Graham bread toast and butter
Poached egg on toast	Creamed green peas	Cup of milk
Bread and butter	Baked potato	Stewed prunes
Cup of warm milk	Bread and butter	
	Homemade ice cream (not too sweet)	

School Age.—School life frequently necessitates an unfortunate change in the dietetic régime of children. When the school holds a continuous session from 8:30 or 9 A.M. until 2 P.M., or from 9 to 3 with a short lunch period, which does not enable the child to return home in sufficient time for dinner, it becomes necessary to put the heavy meal at 6 or 6:30. Whenever it is possible a hot meal should be given in the middle of the day with at least a one to one and a half hour break in the school exercises. When a basket lunch is taken it should contain wholesome food: two sandwiches filled with meat, chopped egg or vegetable, peanut butter or cheese; fruit; milk or hot soup or cocoa carried in a thermos bottle; and only one or two cookies or a slice of plain cake, It may be necessary to provide for a more simple lunch to be taken around noon and a heavier lunch at 1 or 1:30 on return home.

Perhaps the most essential and the most abused meal of school children is the breakfast. A child should be made to be up and dressed in time to allow a full 20 minutes for breakfast with ample time to spare to get to school. Breakfast should consist of:

Fruit: orange or grapefruit (or thin jam), baked apple, or apple sauce or any form of stewed fruit or ripe fruit (except melons) in season

Cereal: cooked in winter, cold in warmer periods

Milk or cocoa

Bacon (large slice) or egg

Toast with butter

This is the minimum; as much as the child will eat may be allowed. Without such a breakfast a child should not be allowed to go to school. The chief difficulty is found in too late rising and the hustle and bustle of getting off to the school playground. The importance of breakfast cannot be overemphasized in relation to the maintenance of the health and normal development of the school child.

GENERAL REMARKS ON DIET

So far we have considered the foods which should be given. "Dont's" are bad psychology when applied to the child, but are fundamental when discussing diets with parents. For the infant the instruction must be "not to give anything except as ordered." For the child of 2 to 6 years the prohibitions can be more or less grouped. Do not give tea or coffee. Do not give any fried foods. Do not give too rich or too highly seasoned foods. Do not give fresh or hot bread or cakes. For the school child more latitude must be allowed. It is not the use but the abuse of food which is bad. It is not at all a bad plan to allow *normal healthy* school children hot cakes or waffles or hot biscuits occasionally in winter. No harm will be done if these are given once or twice a week along with other food. In fact it is better to accustom the digestive tract to variations from the routine, for if these articles are not made too much of a bugbear in the way of prohibition there is less danger of there being a surreptitious debauch on cake, doughnuts, etc. The constant use of hot bread and cakes is of course bad. Candy is not a bad food if properly used. The danger of candy lies in its overuse. It is a good plan to give an occasional piece of pure candy directly after a meal. These things are closely allied to habits which will be discussed later.

If a child is to develop normally, detailed attention must be paid to the family food and cooking. The number of abnormal children with digestive disturbances and malnutrition as a result of the use of improper food is legion. A discussion of diet could be continued *ad infinitum;* we have indicated the diet for a normal child in a general way. It is the function and the duty of the physician from the viewpoint of preventive pediatrics to know what food the children under his care are taking, discuss the diet with the parents and advise them concerning it.

CHAPTER V

MENTAL GROWTH, PSYCHOLOGY, HABIT FORMATION AND PSYCHOMETRIC TESTS

So far we have been concerned with the growth and development of the body of the child. Of equal importance to this is the subject of the growth and development of the mind. In the past as a matter of fact the mind has been considered of greater importance from a social standpoint, as is witnessed by the educational system which has been provided for children contrasted with the provisions which have been made for the physical side of their development. The close interrelation between physical growth and mental growth and the interdependence of the two has been slow in gaining recognition, but that the importance of this relationship is at last being recognized is seen in the rapid strides and progress which have been made in the development of the physical and health sides of our educational program. At the same time the realization has been developing that the physician must not only be concerned with the body health of his patients, but with their mental health. In pediatrics we are more and more recognizing the necessity of a knowledge of the psychology of childhood on the part of the physician who has to do with the care of children. Mental hygiene is only a phase of the general hygiene of the child, but a phase whose importance is steadily gaining recognition.

A striking parallelism exists between the mental growth and development of the child and the physical growth. Both are continuous processes and the conditions existing at any one time are influenced to a large extent by what has gone before. Moreover, there is a distinct periodicity of the curve of mental growth somewhat similar to the periodicity pointed out in discussing physical development. In early infancy the mental reactions and stimuli are largely associated with what might be termed the nutritional necessities of life. Thus the young infant reacts to hunger, pain, and temperature, and outside of

these reacts to but very little. It is not until the third month that the infant begins to take a wider interest in its surroundings. At this time we find him showing an interest in individuals and objects; and that there is pleasure or satisfaction in these new interests is evidenced by cooing and smiling. The development at this early stage is largely the development of the special senses, and through sight and touch, in particular, rapid mental strides are made. The beginnings of coördinated muscular movement of a purposeful nature is also seen at this period. From this time on progress becomes so rapid that it is almost impossible to keep in touch with the development. Perhaps what we must recognize as the most important development comes in the second year with the beginning of independent locomotion and speech. It is difficult for the adult mind, which has little or no remembrance of this period, to grasp the tremendous world which is opened up to the infant at this time and in the years immediately following through locomotion and speech. The instincts of curiosity and imitation which are inherent in every child are important aids in this development. There is of course a marked difference between the world of the child, which has so aptly been termed a "play world," and the values of our adult world. Another of the striking characteristics of the child's life at this period is the extent to which the imaginative element is developed. Thus we see inanimate things endowed with life and values which are as real to the child as the values which the adult world gives to living things.

In this early stage of development the child's personality and characteristics are governed by the repressions and inhibitions which are placed upon it by the caretakers and parents, and the child obeys unquestioningly the decisions of those with whom it is surrounded. Willfulness at this time is rather a behavior or habit problem than a matter of mental independence. Following this period of exceedingly rapid mental development and growth we enter into the period of school age where as a rule the child becomes more or less of a cog in a machine. The normal child obeys unquestioningly the authority and rights of the teachers and accepts the mental discipline and training which custom and adult experience have placed in the school curriculum. There is, however, an important stage of social development taking

place at this time as the child learns to accustom himself to new interests and to adjustment with a group outside the immediate family circle, and must meet the necessity of fitting in with the code of his playmates and the give and take of companions of his own age. Throughout all of these early years habit formation is one of the most important phases of mental development. The basic traits upon which habits depend appear very early and the general character of a child's habits is largely formed before the sixth year.

With the development of pubescence we reach one of the most important phases of the life cycle, the period of adolescence or youth, which marks the transition from childhood into maturity. It is a perplexing, difficult, and even dangerous period, but one that is nevertheless fascinating to watch and study. The difficulty, perhaps, is that we are apt to think of the period as made up almost entirely of rapid physical development and sexual maturity, ignoring the deep-seated and fundamental changes which are taking place in the development of the mind and in the psychology of the individual. These two phases of development may be quite independent, although the developing sex instinct necessarily colors and influences the mental changes and the necessary social adjustment.

From a psychological standpoint adolescence is the period when the child turns from a limited, protected environment into one in which he learns to think and act for himself as an independent social unit in the world at large. At this time there is an awakening of a new consciousness on the part of the child and with this comes a questioning of the authority and restrictions of the environment in which the child has been living. Introspection and self-analysis become favorite occupations and as a result secretiveness, reticence, and taciturnity often appear. Almost without exception the child creates for himself a sense of being misunderstood—at root a failure to understand himself—and this leads to difficulties at home and at school. Parental and school authority which have heretofore been passively accepted become questioned. New discoveries on the part of the child are constantly being made and independent individual attitudes and opinions toward social, economic, racial, and religious questions are formed. Quite naturally many of these are incomplete and illogical

and are amusing to the adult who has passed through this stage of development. They are nevertheless very real to the child and a superior, amused attitude on the part of elders toward these new and immature viewpoints is a common source of misunderstanding and friction between parents and children. Self-expression becomes a necessity and so often we find the juvenile turning to writing poetry, keeping diaries, and like outlets. One of the striking characteristics of adolescence is a marked instability as the newly awakening mind peers first into one and then into another sphere of activity. It is as a result of this that we find the interests and ambitions of the child undergoing a constant change and vacillation. With this broadening of viewpoint and the normal instinct of the adolescent to create his own world, we see the development of new friendships and intimacies outside the restricted circle with whom the early years of childhood have been spent. The character of the recipient of these intimacies and friendships is of greatest importance to the happiness and welfare of the child, but they are exceedingly difficult to guide. It is an extremely trying age for parents and teachers and requires, above all, patience and understanding. Lack of understanding on the part of parents frequently leads to a clash of interests which alienates the child's love and respect and may end in serious family and social maladjustment. The physician through his intimate family relationship has many opportunities to observe the adolescent problems, to give a word of advice and encouragement to the parents; and above all he should maintain his friendship with the child, as an understanding older friend is often very much needed.

Psychology in its broad sense means a knowledge of the mind: how it develops, how it works, how it reacts, and the conditions influencing its working. Psychology, like all other sciences, has been developing rapidly and at the present time there are a number of so-called "schools of psychology" whose controversies and differences are quite perplexing to the student of medicine who attempts to apply in his own field the knowledge which has been gained in another. The older psychology was largely speculative and philosophical in character and permeated with the discussion of "ideas" and the study of "consciousness." To this has been added the psychology of "behaviorism," the

"instinct" psychology of McDougal, the psychology of the "unconscious" of Freud, Jung, and Adler, with its repressions and the attendant vogue of psychoanalysis. Another group of psychologists has developed individual psychology and the field of mental measurements and psychometric testing. It is entirely beyond our scope to enter into a discussion of these schools, their differences and controversies. We are interested rather in what we may gather from them in relation to the mental growth and development of the child which is of practical importance to the pediatrician. Thus a discussion of the exact meaning of the term "instinct," whether it is a concrete or an abstract idea, and the differences between an instinct and the emotional state accompanying the instinct is of little interest or importance to the physician; but the conception of instinct and emotion has definite practical value in explaining some of the phenomena of a child's reactions and behavior which is of real importance to the physician. We mention these various schools or departments of psychology as it is the result of these different viewpoints and methods from which the subject is approached by psychologists that such marked differences in the scope and character of the various discussions of the psychology of childhood exist, and as it accounts for the totally different character of the texts which have appeared on the subject. It can be said in passing that a satisfactory "Psychology of Childhood" is yet to be written. The most recent book on the *Psychology of the Preschool Child* is simply a book on psychometric methods and interpretations. We find that the use of the term "psychology of childhood" is a very loose one, as it includes everything which has to do with the mental growth and behavior of the child, and the subject may be approached and developed from widely different angles of philosophy or experimentation.

INSTINCTS, EMOTIONS, AND PSYCHOLOGICAL CONFLICTS

An infant is born into the world with certain instincts associated with corresponding emotions which are a part of its inheritance. Psychologists differ as to the number and classification of these instincts and emotional reactions, but among the most important are fear, rage, and love. To these which are the most obvious others may be added,

as curiosity and wonder, disgust and repulsion, self-abasement and inferiority, self-assertion, and self-display. Different individuals possess these instincts to different degrees, seemingly the result of inheritance; but to some degree they are shared by all. They play an important rôle in the development of the individual, both in habit formation and in that subtle something which we define as personality. These instincts and reactions are brought into play by various kinds and types of stimuli, which are in large part determined by the environment with which the individual is surrounded. Thus we have working two forces in the development of the child's personality and habits—an inherited factor and an environmental factor. When these instincts are brought under control and properly guided the individual learns to adjust himself to his environment and surroundings, but when there is failure of control or faulty development, problems arise that not only lead to abnormal mental development but have a deep and far-reaching influence on the physical well-being of the child. Later on, more complex tendencies or traits appear, as imitation, play, gregariousness, acquisitiveness, and the like, which are likewise important developmental factors. As we cannot alter the instincts with which the child is endowed through inheritance, our work and problems become chiefly those of child guidance, in order that the emotional reactions may be brought into rapport with the environment and in this way character and conduct be molded.

In early infancy the reactions are of a fairly simple type and responses are brought out by uncomplicated types of stimuli. Thus the infant becomes enraged if it is not fed when hungry and expresses the emotion in a decided manner, and the sense of satisfaction is immediate when the hunger is appeased. The earliest love for the mother has been looked upon as an expression of satisfaction when physical wants are appeased. Contrast this with the complex mental process which will induce an older child to refuse to eat so as to attract attention to itself, or with fear or jealousy as the origin of a complex functional disorder. Throughout childhood the caretakers and teachers with whom the child is surrounded utilize these instincts in the control and education of the child. In one way or another, through training, imitation, habit formation, and the like, the average child learns to

bring these various instincts and emotions under control, works out in some way his adjustment to the general social scheme, and develops his personality.

At times, however, there is a failure of adjustment, usually through faulty training or environment, and reactions develop which we know as conflicts. Thus a child through jealousy of a younger or older sister or brother will reach the conclusion he is no longer loved by the parents; or through fear will develop vomiting attacks. These emotional conflicts not only seriously interfere with normal mental development and social adjustment and may be forerunners of mental derangement, but are the origin of many of the functional and systemic conditions which interfere with normal physical development. Emotions produce definite physical manifestations and physiological reactions. Thus, for example, anger will take away the appetite and interfere with the secretion of the digestive fluids, and fear will cause capillary contraction and tachycardia. While all the instincts play a rôle in the development of the child's mind and personality, some are much more important than others to the physician. From a purely medical standpoint fear is one of the most important of the instincts and emotions. It may be excited by many things, as physical pain, sickness, solitude, or even by loud sounds in early infancy. Not infrequently it is forced into a dominating rôle in the child's life through its use as a method of discipline by ignorant parents or irresponsible caretakers. Even in this day of "popular psychology" one encounters the child who screams when the physician approaches as the result of calling the doctor to threaten the child. Fear once established frequently leaves a mark which lasts through life, even long after a rational stage has been reached. Fear of pain, fear of fire, fear of some individual, and the like are not unusual causes of functional disturbance in childhood. Fear can only be overcome or outgrown through understanding and reasoning, and all too frequently one finds parents attempting to overcome fear by force. One cannot reasonably expect a child terrorized by solitude or darkness to sleep well and healthily if put willy-nilly into bed in a dark room and the door shut. One often sees fears in parents which have been engendered in them in their own childhood passed on to children, by example, not by

inheritance, as the fear of thunderstorms. Fear is a most common cause of habit spasm in childhood and in one way or another is perhaps the most frequent form in which the physician sees failure of emotional adjustment.

Anger is a frequent cause or source of behavior problems in childhood. Not only are children with an excessive or uncontrollable anger instinct difficult to discipline but such children frequently indulge in temper tantrums which are so frightening to the family that the young child learns that by having a "tantrum" he can have his own way, and in this manner the temper tantrum becomes a means toward gaining an end. Curiosity is one of the most important of the instincts from the standpoint of education and the development of the mind. When properly balanced it is a most desirable instinct and should be encouraged.

Self-interest and self-aggrandizement are sources of many of the behavior problems, particularly those of a dietary nature, as will be discussed later. Later on in the pubescent period other instincts enter in, as the "herd instinct," and it is also at this time that the sex instinct becomes an actual force in the child's life. While some psychologists have attempted to show that the sex instinct is of dominating importance from earliest infancy and that nearly all of the child's instincts, emotions, and reactions can be explained on this basis, it is far from being more than psychological speculation.

HABIT AND HABIT FORMATION

Habits dominate our lives. Not only are the thousand and one more or less mechanical actions which the individual performs each day largely a matter of habit, but in addition habit determines our ways of thinking and feeling to a large extent. Because of this dominating influence of habit in our daily life and in our conduct, which is the basis of character, the importance of good habits and the menace of bad habits are obvious. As childhood, and early childhood in particular, is essentially the period in which habits are formed, the subject is one of decided importance in any consideration of the development of the child. We may say without exaggeration that the first few years of life are largely spent in forming habits, and if the

traits acquired during this period are bad the remainder of one's life may be spent in trying to overcome them.

The question that first arises is: What do we mean when we speak of a habit? Habits are based upon the various instincts and their associated emotions which were discussed above, but habits differ from instincts in that they are acquired while instincts are inherited. A habit may be looked upon as a system of reflexes, whose pattern or form is acquired, which is brought into being by a stimulus. As the stimulus is usually one of an associated character we may regard habit as a system of conditioned reflexes. Habits may be easy or difficult to acquire, according to the character of the emotional reactions of the child, as this in a measure governs the pattern of the response. They are further dependent upon the source and type of the stimulus and as the origin of this is found in the environment, the character of the surroundings is of greatest importance in determining the character of the habit formed. In order that a response shall become fixed and automatic and thus formed into a habit, a certain amount of repetition or practice is necessary. In this the attitude of the individual is of importance in that when the practice gives satisfaction the habit is easily formed or built up, but when the practice is associated with an emotion of annoyance or dislike the formation becomes difficult.

Without going further into an academic discussion of the terms habit and habit formation it must be emphasized that habit formation begins in earliest infancy and habits are in large part definitely molded for better or for worse by the end of the preschool years. All too frequently one sees a young child developing improper habits, even obvious to the parents themselves, whose correction is put off day by day until the bad habit becomes fixed and difficult or impossible of correction. Good habits are fairly easy to form, but bad habits are exceedingly difficult to correct. Certain habits, as those in particular which relate to food, have a decided and important influence on the field of nutrition and hence in turn upon health and the physical growth and development of the child; while other traits, using this term for an acquired way of thinking or feeling and hence in the sense of a habit, are connected more with the mental and social side of the child's development. These latter habits play a large rôle in the

formation of character, in the development of normal mental growth, and, conversely, in the origin of psychopathic trends. Normal development and faulty development, good health and poor health, good conduct and bad conduct, happiness and unhappiness are all dependent in many ways upon the habits of the given individual. As the type of habits developed in the earliest years remains fixed to a large extent throughout life, the question of habits and habit formation is worthy of serious attention of the physician who has in any way to do with children. A discussion of habit formation and habits as related to the many aspects of the life of the child could be carried out almost without limit. Our discussion is of necessity limited to a few, the ones which are of particular importance in the field of development and which have to do with the subject of health.

Food Habits.—From a medical standpoint the most important field of habit formation and group of behavior problems in early childhood is associated with the question of food and diet. It most commonly develops that the child will not eat some essential type of food, or, as the parents say, will not eat at all or only when hours are spent in coaxing, or when the child is bribed. To these may be added the minor problems of the child who partakes too much of things that are not good for it. It may be said that the great cause of dietetic problems is the failure of parents and caretakers to recognize that the formation of habits, good and bad, is started in early infancy. The whole gist of the subject of dietetic faults and problems is their avoidance, and hence the essential thing is the formation of good habits. This is so obvious as to seem almost unnecessary of statement, but as a matter of fact the number of parents who fail to grasp this simple truth is legion. The first step is the development of regularity in the taking of food, and this, as has been pointed out, should begin at birth and be persisted in throughout childhood. The second important factor is to accustom the child to take different foods and new foods without question. This is one of the reasons why modern infant feeding practice adds cereals to the diet by the fifth month and vegetables by the sixth. One of the common problems met with is the exclusively breast-fed infant of eight or nine months who refuses to take cow's milk or other foods and must be starved and even at times

separated from the presence of the mother when weaning becomes necessary. If other foods than milk are offered early this weaning problem is avoided. In the same way a wide variety of cereals and vegetables should be offered by the eighth month, with daily changes or changes three times a week; catering to slight preferences on the part of the infant should be avoided. Very frequently caretakers give in to slight preferences in an overanxiety that the child should eat, unless they are warned of the danger of this in habit formation. On the other hand the forcing of foods, particularly if new, is never advisable, as a definite aversion may be started at an early age. Infants who are given a fairly wide variety of selection rarely develop food habits of the type of difficult likes and dislikes for specific foods.

When the infants pass into the second year of life and reach the time when three meals a day are being given the food problems are as a rule of a more complex nature. It is at this time that the child unfortunately learns that what it eats and whether or not it eats is a matter of great anxiety to the parents or caretakers. Furthermore, many children learn that by not eating they will be coaxed or bribed, and that their attitude is one that attracts a great deal of attention to themselves and satisfies their instinct of self-importance. Meal time will often be made to last for hours to their personal joy and satisfaction. As soon as a child is old enough to feed himself, the food should be placed in front of him to eat or not as he likes, and after 20 to 30 minutes taken away and no food given until the next meal time. As children grow older and understand more what is being said, entirely too much discussion is held in the child's presence in regard to food and the child's attitude, likes, and dislikes. Many dislikes toward certain foods are the result of an expressed dislike on the part of parents and caretakers. There is a very definite psychology about eating, and children, as well as their elders, do better when the meals are shared with some one than when eaten alone. The single child in a family is at a great disadvantage and develops problems much more frequently than when there are two or more children who eat together. Unpleasant scenes, anger spells, and the like just before or at meal times are definitely prejudicial to the child's meals and digestion.

It is a matter of experience that most food problems in early child-

hood arise from a lack of knowledge or from overanxiety on the part of the parents. The physician must not only watch the formulæ and the diet list of the infants and children from a purely nutritional or technical standpoint, but he must constantly stress the importance of proper food habits and the avoidance of behavior problems in relation to food. Neither can be neglected in the field of infant feeding and dietetics of childhood without the probability of affecting normal growth and development, and yet all too frequently there is a tendency on the part of physicians to prescribe food and diet lists, excellent perhaps in themselves, and to ignore totally the environmental problems of the individual child and the matter of habit formation.

In older children of school age many of the nutritional problems have a behavior side or background which should have been avoided. Thus the excessive eating of sweets, particularly between meals, takes away the appetite for the properly balanced ration of the regular meal. Fatigue and overexcitement, family rows and disagreements aired at the table, and the like are not infrequent causes of a child's lack of appetite for which the parents desire a "tonic." Too late rising, so that the child hurries through a scant and hastily bolted breakfast and rushes to school, is one of the most common sources of dietetic and nutritional problems in children of school age. A great deal might be said regarding many of these problems, but, as can only be reiterated time and time again, the crux of such situations is their prevention, and this is simply the avoidance of the factors and conditions which lead to their development.

Tantrums.—Among the many questions of habits which are of importance in the normal development of the child one or two more are frequently brought to the attention of the physician. Temper tantrums are frequently a source of worry to parents for which they seek medical advice. They are most frequently a device on the part of the child for gaining his own ends. Breath-holding spells, screaming attacks, head banging, and the like alarm the caretakers and parents who fear they will make the child sick or that the child will do himself physical injury. They create attention and anxiety and not infrequently this alone will cause their persistence and develop them into a habit, or the child will be bribed and in this way will

develop the habit of using the tantrum as a means to an end. One must be sure that such tantrums or attacks are not the result of overexcitement or fatigue, or that lack of play as an outlet to the necessary and normal physical activity of the child is not a background. Further there is often an imitative element present as the result of high-strung caretakers and parents who lose their own tempers and take it out on the child. If tantrums are used by the child to gain his own way, to attract attention, or to secure a bribe the remedy is obvious. The danger lies in the lack of emotional control being formed into a habit which is carried over into adult life and which in school life leads to difficult social adjustment with playmates.

Jealousy.—The importance of jealousy in the formation of behavior and personality problems is not sufficiently appreciated. Too often it is encouraged by parents who look upon it as something "cute" in the young child and do not realize that the instinct may have a serious influence if allowed to grow into a habit. It may lead toward definite hatred to brothers or sisters or it may develop the feeling of self-inferiority to a pathological degree, leading to reticence or abnormal shyness, which may leave a definite imprint on the child's personality. In older children jealousy is sometimes seen as the basis of psychological conflicts leading to malnutrition and habit spasms, and when it becomes fixed into a habit it leads to definite problems of adjustment which are a source of much unhappiness in later life. It should be avoided by insistence upon fairness to all the children, by not holding one child up as a shining example to others, and by inculcating a sense of sharing things with others.

While not so intimately a medical phase of habit formation, the matter of the formation of habits of obedience is so fundamentally related to normal growth and development that it deserves some consideration. Children are not born obedient; obedience is an acquired habit. To develop obedience one must first of all expect obedience. Much of the disobedience one sees is the result of the knowledge on the child's part that obedience is not expected but only hoped for. There is usually something to be said on the child's part when the child is disobedient—in fact this is true of almost all behavior problems—and many times the origin of the child's disregard of a com-

mand or order is found in the unreasonableness of the order or previous orders. Parents are too apt to be amused by a certain thing at one time and to be annoyed by and prohibit the same thing at another, which develops a situation beyond the child's understanding. One often sees and hears *needless* commands, interrupting without reason the child's play and occupation. The exercise of authority should not be a matter of whim and the child who is caressed and petted one moment and then angrily punished the next soon learns deceit and craft. Honesty and fairness are cardinal principles in developing a child's personality and in maintaining its respect, and without these little can be done in building up habits and character.

MENTAL MEASUREMENTS

One of the most important developments of modern psychology has been the establishment of norms or levels of intelligence for age periods. In 1905 Binet and his coworker Simon published a series of graded tests designed to test the general intelligence of children at different age periods. Certain things which the average child does at a certain age were determined and tests devised to ascertain whether the individual child has reached this stage of development. By developing series of tests at different chronological age levels the mental age of the child could be determined. The tests utilized complex processes and, in a measure, were largely tests of the language function. The original Binet-Simon tests included the 3- to 15-year age periods. Many modifications of the Binet-Simon scale have been made by subsequent workers together with changes in the method of recording and comparing results. The Stanford Revision by Terman and his associates is the scale in chief use in this country. The recording of tests is frequently done in the form of an intelligence quotient (I.Q.), which is the mental age of the child as shown by tests divided by the chronological age. An I.Q. of 90 to 100 is regarded as showing average mental ability, and inferiority or superiority is based upon whether the I.Q. is below or above these limits. Many of the revised tests require considerable apparatus and forms which are on the market.

It has been only in the last few years that a careful attempt has been

made to study the mental development of the infant and child of pre-school age. While pediatricians have had a general notion in regard to the mental development of the infant, as to the age of recognizing individuals, of walking, talking, and the like, there have been no carefully worked out studies of mental norms until the last year, when Arnold Gesell published the results of his observations at the Yale Clinic. Tests of mental development of young infants requiring the use of language (in order and in response) cannot be utilized and hence tests are largely motor in character. Thus Gesell has found that if a set of small red blocks are used the infant's reactions are as follows:

At 1 month he can hold block pressed into hand.
At 4 months he can look for it.
At 6 months he can reach for it.
At 9 months he can look for it when it falls from sight.
At 12 months he can place it in a box.
At 18 months he can build a tower of 3 blocks.
At 3 years he can build a bridge.
At 5 years he can build a stairway.

In order to point out the development by age periods a number of norms or tests at different chronological levels are given below, selected from Gesell's, Simon's, and Terman's material, omitting tests requiring special apparatus. They are not so much for purposes of testing as rather for showing the character of the norms at different age levels.

At 6 months:

Sits up with support.

Uses hands to reach and grasp objects.

Laughs and coos in response to definite impressions or stimuli.

Recognizes familiar persons and may be conscious of strangers.

Plays actively with a rattle.

At 9 months:

Sits without support.

May creep and attempt to pull itself up.
Says "dada" or "mamma" or equivalent expressions.
Looks for definite objects which have fallen.
Uses nursing bottle without aid.
Has definite likes and often dislikes of people.

At 1 year:

Stands with support and walks with help (occasionally walks alone).
Uses one hand in reaching.
Can wave or even say "bye-bye."
Holds cup to drink from.
Imitates simple acts.

At 18 months:

Walks alone. Climbs stairs.
Uses five or more words.
Points to nose and eyes.
Uses blocks to build.
Uses spoon fairly well in eating.
Bowel control established.

At 2 years:

Draws a vertical stroke from copy.
Uses simple phrases in talking.
Asks for things by name.
Folds a paper imitatively.
Bladder control established.

At 3 years:

Draws circle from copy.
Combines parts of a picture cut in two.
Names three objects in simple picture.
Repeats 2 digits and 6 or 7 syllables.
Points to parts of body.

At 4 years:

Draws cross from copy.
Repeats sentence of 10 to 12 syllables.
Buttons clothes and washes self.
Knows sex.

At 5 years:

Draws triangle from copy.
Compares 2 weights.
Laces shoes and puts on coat and hat alone.
Counts 4 or 5 pennies.
Loses infantile articulation in speaking.

At 6 years:

Knows right and left.
Counts 12 or 13 pennies.
Knows different coins.
Repeats 16 or 18 syllables.
Can show error in mutilated pictures.

At 7 years:

Can copy diamond.
Repeats 5 digits.
Ties bow knot.

From this time on the tests of intelligence level becomes more complex, requiring designs, vocabularies, and dissected sentences. For details of these tests the reader is referred to Gesell's book on *The Mental Growth of the Preschool Child,* and that of Terman on *The Measurement of Human Intelligence.* We have simply tried to point out the type and character of the development of the mind of the child as shown by the method of psychometric testing. The tests in the earlier years, as will be noted, are largely tests of the child's actions at a given age and mental retardation is largely the question of the failure to do certain things which the average child does at a certain chronological age.

Psychometric measurements are of importance not only in determining whether or not a child is mentally backward, but as a method of recording the normal development of a child in the same way that the curve of growth is used for recording physical development. Not infrequently problems arise in regard to the failure of a child to maintain average progress in school. In such circumstances one has to consider whether the difficulty is physical or mental and in this mental tests become of greatest importance. Not infrequently both

the physical and mental conditions will be found normal and the origin of the difficulty will be found in the environment or in a more purely psychological or behavior problem.

Psychometric testing has many pitfalls and the testing of children requires practice and experience. With the growth of interest in mental hygiene, trained experts are now available in nearly all of our larger cities, state universities, and medical centers. Older children must be tested alone, while young children usually must have a parent or nurse with them with whom they are familiar or otherwise the unusual surroundings produce abnormal mental reactions. Children frequently fail to accomplish all the required tests of a given age period and often will pass one or more tests of a period above the chronological age of the child. While the average physician cannot be expected to be an expert in psychometric testing, the physician who practices in the field of childhood must have a clear-cut idea of the tests, their uses and limitations. They must be looked upon as an aid or adjunct in diagnosis and the outlining of treatment in the individual problem presented. The physician should use them in the same sense he uses the x-ray or laboratory examination—as an aid in forming a complete picture of the problem in the individual child; for the data furnished by the psychometric examination is often of the greatest value in forming a judgment when taken into consideration with the physical and environmental data. Unfortunately there is a tendency on the part of some so-called psychologists to consider mental testing as an end and not as a means to an end, and not infrequently one finds this type of psychologist attempting to pass judgment on the child as a whole through psychometric examinations alone. Properly used and properly interpreted psychometric tests have a definite place in the field of preventive pediatrics in that they furnish a standard of mental development.

CHAPTER VI

HYGIENE AND EDUCATION

HYGIENE

We have grouped together in this chapter the discussion of a number of miscellaneous topics which have to do with the growth and development of the child and the maintenance of health. A number of subjects which might be included under the general term "hygiene" have been discussed in the previous chapters on food and habits. We have intentionally omitted a discussion of much that has been written on the subject of the hygiene of infancy and childhood, as, for example, the nursery, bathing the baby, the care of milk bottles, and like subjects. There are a number of excellent manuals and pamphlets on the care of the baby and the child, as "The House of Health" series of the American Child Health Association, and the bulletins of the Children's Bureau, written for mothers, which explain many details which the physician rarely can give by word of mouth but must give through printed instructions. We are concerned more with certain special matters which either must be watched by the physician or which come to him in the way of questions by parents.

Rest and Sleep.—The growing organism must have sufficient sleep. The newborn baby whose mechanism is largely vegetative sleeps from 20 to 22 hours out of the 24. From this time on the amount of sleep required gradually decreases. At 6 months the average length of sleep is from 16 to 18 hours and at 1 year from 14 to 16. From the second to the sixth year 12 hours at night and a daily nap or rest meet the needs. The requirements of older children are approximately: 6 to 8 years, 12 hours; 8 to 10 years, 11 hours; 10 to 12 years, 10 hours; 12 to 15 years, 9 to 10 hours.

Beginning in early infancy the baby should be trained to sleep all night from 6 to 6, except for the night feeding. Many breast-fed

babies do not require this feeding, but it usually is necessary before the third or fourth month and with bottle-fed babies. Day sleeping in infants and night wakefulness is a matter of bad habits and must be vigorously corrected even by keeping the baby awake during the day if necessary. The decrease in sleeping hours should always be made at the expense of the day sleep. At 6 months the baby usually sleeps 2 hours in the forenoon and 2 in the afternoon. The afternoon period should be over by 3 P.M. One of these periods is gradually shortened until by the second year but one nap a day is taken, and this should be continued until the sixth year. Even if children of 5 or 6 no longer sleep, they should be made to rest in bed alone in the room, without toys or books or play of any description. The nap and rest are largely matters of habit.

The infant and child should sleep alone. The bedclothing must vary with the season and the weight should never be too heavy nor too light. Sleeping without pillows is best and if the child is trained this way pillows are not liked or needed. Sleeping on a porch when it is not too cold is advisable if a porch is available; otherwise the windows should always be open, but fresh air does not mean frigid air. Protection from direct exposure and drafts is necessary. Bright light in the early morning, flies and insects of various kinds disturb sleep and rest and hence the baby and child must be protected from them. For restless children sleeping bags are advisable. It is a bad custom, particularly in northern climates in winter, to utilize the best out-of-door hours in the early afternoon for sleeping. With older children a short relaxation period—the child flat on the back on the floor with a small pillow under the shoulders for 20 minutes of absolute silence—just before lunch and then again at 4 or 4:30 when the sun goes down and the child comes in from play, is often of more benefit than an hour's rest or nap after lunch. This scheme is useful in children who fight against the nap and do not rest. It is often a useful arrangement for the kindergarten child. The rest relieves the nervous tension of school with the result that the lunch is taken better and at the same time it permits of outdoor play during the best part of the day. Children need sunlight.

Some children require more sleep than others. Every child must

have, however, a certain minimum. Staying up late at night "as a favor" is apt to break into good habits. If never started it never becomes a source of contention. The bedtime hour should be quieting. Rough play and intense excitement at this time are apt to delay the on-coming of sleep. Stories of too exciting a nature or with a fear element should be taboo. They are real causes of wakefulness and failure to go to sleep immediately or soon after the child has gone to bed. When the child wakes from the nap or night rest it is important to teach habits of rapid dressing, and to prevent dallying and playing until dressing is complete and the morning toilet is finished.

Exercise and Play.—Exercise and play are indispensable for the growing child. Not only does a young child obtain exercise from play, but it is an important factor in mental growth. The infant must be given an opportunity to move and exercise its limbs unhampered by clothing at least once a day, and in addition passive movement of the limbs is decidedly helpful in developing a strong body and tissues. Outdoor play is far preferable to indoor play for both the young child and the child of school age. If children are allowed freedom of space and companionship they automatically turn to types of play involving muscular exercise. The recognition of the importance of play to normal development has led to a distinct playground and recreational movement and many books on play for children of different ages are available. Play teaches self-control and coördination and is of decided importance in developing a social sense as well as necessary from a physical standpoint and a factor of importance in mental growth. Play and exercise to the point of ordinary fatigue are of benefit, as recovery is rapid in childhood and the development of endurance is necessary. Overfatigue to the point of exhaustion is a danger. The amount of outdoor play needed by a child of 6 to 8 years may be put at 3½ to 4½ hours daily. This time gradually decreases to from 2 to 3 hours from 12 to 15 years. This should be divided or broken into periods. As children grow into the prepubescent years exercise and play assume a more definite character and various formal athletic games should be introduced and taught. Baseball, football, tennis, golf, riding, swimming, hockey, outdoor basketball, etc., are suitable and interesting to the child. More formal

indoor gymnastic exercises are not as good and should be reserved for inclement weather or for corrective purposes. In all play of this type there should be supervision and instruction if possible and the equipment should be satisfactory. Overfatigue must be avoided. The rapid muscle growth at this period demands plenty of hard exercise and this holds for girls as well as for boys. The development of athletic interests is the safest and best outlet for the newly developing instincts and emotions of puberty, some of which, as the gang or herd instinct, may have dangerous possibilities if misdirected. Games offer the best substitute for the control of the sexual instincts which have their beginning at this time. Organized play with intramural athletic leagues and competition furnishes the best outlet to give normal direction to the difficult problems in conduct and activity which are a part of the early adolescent period.

Vacations.—A vacation is one of the adjuncts to the maintenance of health and development that has been recognized for many years. A break or change in the usual environment is not only of benefit to the health but, for children of school age, is of educational value.

Whether or not an infant should travel depends largely upon the economic situation of the family. Where the baby is to be moved from the home to a summer home the problem must largely be settled by the question of the character, location, milk supply, etc., of the latter. Breast-fed babies may be moved much more safely than bottle-fed. It is more essential for the runabout children to get away from the city, but again the type of food, housing, etc., during the vacation must be considered. Hotels are rarely suitable for children except temporarily. As children grow older these factors are of less importance and the good resulting from a change of environment—new food, new faces, and new interests—usually outweighs the disadvantages. A radical change is of most benefit. Children from the seacoast should go into the mountains and inland children to the coast, children from the midcontinent to the coast or the mountains. Young children do better as a rule at the seashore, but older children do as well or better in the mountains. For urban children even a slight move into the country is advisable. We must recognize that on account of economic reasons the vast majority of urban children can-

not have much of a vacation. The summer camps and "fresh air" outings have been of considerable importance in furnishing vacations at a small cost. With these camps, however, come institutional problems and they require adequate medical inspection of children before and during the time at camp to exclude skin and other communicable diseases. Summer camps may or may not be advisable. Many are not properly equipped and at others the life smacks too much of school institutionalism.

Clothing.—Clothing for infants and children is fairly well standardized and satisfactory types and models are available generally in clothing and department stores. In deciding on the kind and quantity of clothing to be worn, common sense must be used. For example, in cold, damp climates, as along the northern seaboard, woolen shirts should be provided and worn during infancy, while in southern climates cotton is a preferable material the year around. The overdressing of infants and underdressing of older children are common errors. Clothing for young children should always be washable so that a stain or soil is of no importance. Children should never be dressed so that they cannot play naturally at all times. Simple romper suits are the best for both boys and girls of the runabout age. In winter in northern climates long-sleeved undershirts and full-length drawers should be worn and fashion's dictates, such as bare knees, avoided. As a rule clothing worn in the house should be light, as the average American home is overheated, and sweaters or reefers and woolen leggings provided for out-of-doors play. In hot weather thin wash suits should be worn. Infants during heated spells of weather are frequently best off and most comfortable with only the napkin.

For school use stout, comfortable, seasonable, and inexpensive clothing should be provided, if children are to be made happy. For inclement weather rubber coats of light weight and rubbers are necessary. Particular attention should be paid to stockings and socks, as one cannot expect a child to attend to or be interested in the subject of damp or wet feet. This requires oversight but not nagging.

Shoes are a very important item from the time the infant first starts to walk. The natural position of the feet is nearly parallel and shoes should be built with a straight inner line to maintain this posi-

tion. From the beginning shoes with soles are best, very light of course at first. The soles should be flat up to the fourth or fifth year, when low flat heels may be used. Shoes should always be long enough and wide enough not to cramp the toes and to allow for the growth which is taking place. Patent leather or fancy shoes should not be worn. There are several good models of shoes for children on the market, made of good but soft leather and capable of standing hard usage. Lace shoes are better than button shoes. In summer bare feet part of the time is permissible, provided care is taken that the children do not play where they can cut or bruise the feet. Sneakers should only be allowed for occasional use. Rubber boots should not be worn over a few hours at a time and never for school use.

Many children, from walking too early, overweight, softening of the bones, etc., tend to pronate or supinate the feet when they start to walk. The latter is not so bad and tends to correct itself if not due to severe rickets. Pronation or turning out the feet is more important and apt to become worse as the child grows. Not infrequently it leads to secondary postural defects. During the second, third, and fourth years walking should be carefully watched, as by building up the soles with wedges it is not difficult to throw the feet into a proper position and correct the defect. For older children several types of orthopedic shoes are on the market which are of value in throwing the foot in the proper position for walking. The so-called "foot specialist" in the store should never be allowed to prescribe shoes.

Care of the Teeth.—The nutrition of the infant is of great importance in the formation of sound teeth. Even the nutrition of the mother during the prenatal life is considered an important factor and the mouth and teeth of the mother should be kept clean and healthy with a minimum amount of treatment. There is a difference of opinion as to the care of the gums before the eruption of the first teeth. Some advise careful, gentle massage and others that the mouth should be left alone, the method the author prefers owing to the danger of infection from a careless nurse. From the time the first teeth appear they should be gently cleaned at least once a day. Cotton swabs or toothpicks may be used at first and later a *soft* brush. From the be-

ginning of the second year particular attention must be given to the teeth as the temporary set decay easily and rapidly. Defective teeth without infection should be filled with some plastic material to prevent decay. If possible every tooth of the temporary set should be retained until its place is ready to be taken by one of the permanent teeth. The first of the permanent teeth, the 6-year-old molars, are considered by some as the most important of the set, as they form the keystone of the dental arch. Not only are they most important for mastication but upon them depends in large measure the shaping of the jaw and the spacing of the rest of the permanent set. The first permanent molars should be watched most carefully and any decay or trouble be attended to immediately. Malformations and irregularities in the teeth are common and of importance. They may be more or less hereditary in origin, or due to early decay of the temporary set, or even are looked upon as resulting from obstruction to respiration through adenoids and tonsils. They not only have an esthetic importance but markedly overshot or undershot jaws interfere with mastication and in turn with normal digestion. How much thumb sucking has to do with malformation, the general theory of the laity, is difficult to say. As a rule orthodontic treatment is not attempted before the eighth or ninth year but some dentists attempt to space the teeth of the temporary set when there is overcrowding. As a rule most of the work is started about the twelfth year. The continuous daily care of the teeth is largely a question of habit. It should be started early and the child himself can learn the proper method of brushing the teeth when 3 or 4 years of age. At this time, as in later childhood, the parents should be certain that the teeth are being brushed once or twice daily, and at least semiannual visits to the dentist should be made from early childhood on through puberty.

Bowel Regulation.—Regularity in the emptying of the bowels is essential for good health. Then normal breast-fed baby has from 1 to 3 movements in the 24 hours and the artificially fed from 1 to 2. Sometimes the number is greater, without there being anything abnormal, and occasionally less. Older children have a daily movement, as a rule, and sometimes 2. The regularity of the daily evacuation is in many respects a habit. The accumulation of

fecal matter in the lower bowel is the stimulus which brings about defecation. Constipation—habitual constipation—is one of the bugbears of childhood and pediatrics. In a certain number of children constipation is the result of some anatomical anomaly of the large intestine, but in the vast majority it is the result of bad habits. In part the cause may be faulty diet, but most frequently it is a consequence of too much interference with nature during infancy and in early infancy in particular. The mother reads in some book that the baby must have a daily bowel movement and becomes panicky if this is the least bit delayed, or the trained nurse in the first few weeks desires to display her medical knowledge, gained in some half-understood lecture, and an attempt is made to stimulate the evacuation with a suppository or enema. Or perhaps the baby becomes fretful through overfeeding, too many clothes, or discomfort of some kind and the attempt is made to relieve this by inducing a bowel movement. The movement takes place but the baby learns to wait for this extraneous stimulation and in even a few days a habit constipation will be started. The baby must be left alone for 30 to 36 hours if necessary, even if it is uncomfortable, until it learns that the sensation of a full bowel is the stimulus for a movement. In reality the majority of cases of constipation in infancy are not real constipation but delay due to waiting for an outside habit stimulus.

The habit of regularity of movement should be started in early infancy and is not only good for the baby but of real saving to the time and work of the caretaker. Mothers frequently train their children between the second and third months; and early training is not sufficiently urged by physicians. While the baby is held on the lap, at exactly the same time each day, a basin is pressed against the buttocks. This is repeated daily. Persistence will in a short time teach the baby to associate the feeling of the basin or chamber with the act of defecation.

As soon as children are old enough to sit alone they should be placed on the chamber directly after the morning meal. The peristalsis of the upper intestine induced by taking food helps the peristalsis required for defecation. This should be persisted in and insisted upon throughout childhood until it becomes a fixed habit which will last

the lifetime. Irregularity leading to habitual constipation not infrequently results from the failure to insist on the child rising in time to dress, having 20 minutes for breakfast, and then an unhurried time for the bowel movement before the time comes for leaving for school.

Diet is of course important and the food must have a certain bulk or roughage. Green vegetables and coarse cereals and bread, as a rule, provide this. A regular diet of stewed fruit with the evening meal from the twelfth month on through the early years of childhood is another valuable aid. Another factor is the drinking of sufficient water—a matter which children are apt to neglect unless some oversight is given. It is not so difficult to prevent constipation by the development of the habit of a regular daily bowel movement. Once developed, however, constipation is extremely difficult to overcome and may be injurious to the general health of the child.

EDUCATION

School Life.—A large part of the life of a child centers around his school life and education. Indeed it is the chief occupation of the child from the fifth or sixth year on through puberty and in large measure it dominates his life and determines the manner and mode of living during this period. Not only is school life essential to mental growth, but it bears an intimate relation to the health and physical development of the child. It is, therefore, of importance in a consideration of the growth and development of the child and hence has a place in the subject of preventive pediatrics. We may consider the matter from two viewpoints: first, from the standpoint of the individual child, and secondly, from the standpoint of the school.

The early education of the child up to the time we consider him of school age is chiefly a matter of the growth of the mind through the special senses and the formation of habits. It is largely a matter of the home. The development of the child at this age, therefore, will be influenced largely by the environment in which he is placed, by the character of the home, which in turn reflects the character and education of the parents. At this period, as has been pointed out in

a previous chapter, the child is finding out things for himself. He is developing the instincts which were inherent. The educational problem at this period is the development of these instincts to their fullest extent and the bringing of them into more or less automatic responses which become fixed and thus form habits. The child needs guidance, but guidance based on knowledge and understanding of what is taking place and not upon dictates based upon adult reactions and behavior. It is the period at which the infant develops from a purely protected situation into membership in a social group to which he must learn to adjust himself in a normal way. Fortunate indeed is the child who during this period has brothers or sisters of a near age with whom these early years can be shared. The single child who develops only with its elders is unfortunate. Regardless of the type or character of the parents or home the single child is in an abnormal position, and it simplifies matters exceedingly if we accustom ourselves to regard the single child in this way. This may not be due to any fault of the parents themselves, nor their efforts, but results from the situation itself. Education at this early age is essentially the development of instincts and good habits and the result is a picture of the environment of the home.

At what age should a child enter upon group instruction? The nursery school for children from 2 to 4 years is not as yet of practical importance in this country. Where ideally carried out, as in the few more or less experimental schools, it is apparently of distinct value, as under trained supervisors the education is conceived with as much regard to the health of the young child as to habit training and development of the special senses. It is questionable whether the nursery school will ever become an important factor except for the few, not only because of the cost but on account of the unusual type of supervision required. Such a school carried on without ideal physical equipment, teachers, and health supervision would in all probability do more harm than good to the child.

The next phase of group instruction, for the 5-year-old and occasionally for the 4-year-old, is the kindergarten. Should or should not the child go to kindergarten? The answer to this depends entirely upon the environment of the child. It is a question frequently asked

of the physician by parents and the physician should have some definite and intelligent reasons for his answers. Naturally a good deal depends upon the kindergarten and teachers. Kindergarten should never be the place for formal instruction: it is the place for guided play planned to develop the use of special senses, and it is essential that it shall be conducive to the maintenance of good health and normal physical development. An outdoor playground in connection is a necessity. One can answer yes, or even better should advise kindergarten under the following conditions:

1. If the child is a single child or much younger than the other children in the family.
2. If the children are almost entirely under the care of nursemaids, due to the social or philanthropic activities of the mother.
3. When, as not infrequently occurs, the character and temperament of the mother are such that the home environment is unfortunate.
4. When the mother works, or her family and household are such that she cannot give the children the necessary attention.
5. When the children have no place to play except the streets.

These reasons extend from one social pole to the other; and with the increase of apartment house life in America the kindergarten is becoming more and more a necessary part of our educational system.

As a general rule kindergarten is not advisable unless the child is physically at par, the exception to this being the case of the single child for whom kindergarten and the mixing with other children may be the necessary treatment from a physical standpoint. The chief objection to kindergarten is the fact that the mingling of young children in school is always followed by exposure to and the development of various infectious diseases, from the common cold to the more severe exanthemata. As a general rule the older the child when infections develop the quicker the convalescence and the less mark or setback they are apt to leave upon growth and development. When

two or more children with intelligent parents and caretakers have an outdoor place to play, the disadvantages of starting school so young offset the advantages. It is difficult to note any differences in their subsequent school career between children who have and have not attended kindergarten.

At 6 or 7 years the child must enter school and formal education begins. The character of the education changes as a whole and the child no longer develops in a free or natural way, but the attempt is made to force the accumulated knowledge of generations into his head. Willy-nilly, regardless of the character, temperament, and individuality of the child, the same mold of education is poured for all. For a considerable period, education for the vast majority consists in the memorizing of facts for examination, facts important and unimportant, interesting and uninteresting, stimulating and wearisome, true and false. This is what education consists of at the present time for almost all but an inconsequential few. This is not an essay on pedagogy nor the place to discuss progressive tendencies in education and their importance, but the subject of pedagogy is of real importance in the development of the child. Rare indeed is the teacher under the present school system who can make facts of living interest to the child and who can stimulate the child to learn to think rather than accumulate facts, which, after all, is the real purpose of education. Not at all that education should be haphazard, happy-go-lucky and indefinite, and that formal training is not necessary to discipline the mind to think clearly and intelligently, but education should create a desire for knowledge from within—the utilization of the natural instincts of the child—rather than its acceptance as a result of force from without.

As a rule life goes along fairly smoothly and easily until the tenth to twelfth year or thereabouts, the child accepting the dictum of the wisdom of its elders. The progress children make during this period is almost wholly dependent upon three factors: the inherent intelligence of the child, the physical condition and health, and the habits acquired during the earlier preschool years. It is at about the tenth to twelfth year, the beginning of pubescence, that difficulties usually begin. Changes in character and temperament, which up to this

time may be latent, or even apparent but unimportant, begin to manifest themselves and play a more important rôle in development. This may be termed the difficult or dangerous age of childhood. With the beginning of sex development and differentiation at this time and the acceleration in the rate of physical growth which occurs, new instincts, reactions, and tendencies develop and personality traits become more definite. School work becomes much more of a task and a bore and even the character of the studies of the curriculum are unfortunately less interesting. Quite as a natural part of development the child's instincts reach out after independence. Parental and school authority and wisdom, heretofore passively accepted, become questioned. The why and wherefore of it all begins to be asked of himself by the child. It is difficult to understand the child at this period, for as it has been said: "He does not know himself and what he knows he cannot express." With this, as a normal, natural part of the growth and physical development of this period, comes an interest not in educational things or mental growth except in so far as this desire for new things and experiences is in reality mental growth, but an intense interest in physical things, as games and sports of various kinds. And soon, before the parents realize, the child is passing into the early adolescent stage of manhood and womanhood and with this comes a subjective personal interest in sex which so often creates new school and environmental problems. This is the natural law of the development of life; its origin is biological. With the broad conception of growth and development which preventive pediatrics implies, the importance of school life and education is obvious.

Throughout the years of school life it is the function of the physician to see that the child's physical development parallels and keeps pace with the mental growth and education, that the one is not being sacrificed for the other by overambitious parents or as the result of improper habits of living. If the normal or average rate of development is not being maintained it is frequently the result of a faulty day's program, improper food, due to allowing the school hours to interfere with the meal hours, lack of rest, overstimulation in children of unstable tension, fatigue, due to extramural activities, as dancing and music, lack of outdoor exercise and play (particularly during the

winter months), too long hours over the books, or unnecessary worry over examinations. As a rule it is not the length of the school day which is at fault but its faulty arrangement. Provided the school schedule contains hours for meals and play and frequent recesses, the school day can be longer than is customary, even, at times, to the advantage of the child physically. Children differ not only in their mental capacities but in their physical capabilities and it is not possible to make every child fit into the same schedule. The physician should have a knowledge of the life of the child while he is attending school, so that, if necessary, it may be corrected before the child deviates from the norm, and not a knowledge of his school life obtained when the child is brought for treatment.

In older children a clear idea of the type and character of the games and athletics is necessary, as these are of fundamental importance during the period of accelerated growth in the late pubescent and early adolescent years. Moreover, as these later years are reached, factors of a more subtle nature come into play. At this time, with the normal opening up of new instincts, the type and character of the school companionships have a decided influence on the development of the child. The old adage of knowing a person's character by his friends is equally true of children, and furthermore, at this time, when character and personality traits are not fixed but are being molded, the group friendships are most important.

Not every school is fitted to the needs of every child. Frequently one sees a child fail to fit into the life of a certain school or group. As a result inferiority complexes, unhappiness, unfortunate introspective tendencies, and the like develop and have a decided reaction upon the physical and mental health of the child. Not infrequently a change of school and the formation of a new group of friendships free from the old prejudices—real or imagined, as the case may be, the result is the same—will see an almost complete change of personality traits in a child and the return to normal development when there have been more or less dangerous tendencies to abnormal deviation. This does not mean that the selfish, spoiled child must not be made to face adjustments and his every whim or fancied injustice be satisfied. The child must be made to see that life is a matter of give

and take and adjustment with his fellow beings. The proper direction of the tendencies of this period, if normal development is to be secured, requires at times the closest coöperation of the parents, teachers, and physician.

In his relation to the school itself, the physician to the child has certain definite responsibilities. This is quite apart from "school hygiene" which is discussed in Chapter X. Not only must he be satisfied that the school buildings are satisfactory from the standpoint of hygiene, cleanliness, ventilation, toilets, etc., for in matters of this kind the family physician has a duty and responsibility to the families in his clientele, but he also should know whether or not the school program is adapted to the individual child. Not infrequently the author has had occasion to advise the sending of children in the same family to different schools. Schools have decided individualities and some are better suited than others to certain children. The physician should know further whether the school has provision for outdoor play and exercise, whether or not adequate measures are taken for the detection and exclusion of communicable diseases, whether or not the school takes a proper interest in such questions as physical training and posture, with the purpose in view that if these are not a part of the school functions he will pay closer attention to them himself.

In brief, school life and education form such an important part of the development of the normal child that the physician must have an active interest in the school life of his patients and in our educational system and schools. He must know the character of and the training given in different schools, so that he can advise parents intelligently. He should know what the individual child is doing in school, his scholastic and athletic record, his friendships and companions. He must coöperate with the teachers in a helpful and not an interfering way. Experience has shown that intelligent teachers appreciate such an interest, and there should be close friendship between teachers and physicians who form the chief aids of parents in bringing up their children. In fact it is upon these three that the responsibility of the normal development of our youth rests.

Sex Education.—The subject of sex education is a matter of importance and perplexity to parents. It is a question which is fre-

quently taken by them to the physician for advice, and as a matter of fact it is a subject which the physician should go out of his way to take up with the parents of the children under his care. A great deal has been said and written concerning the subject and some valuable literature for parents has been prepared by the American Social Hygiene Association. Unfortunately much that has been said and written about the subject of sex education is sentimental tommyrot. As a matter of fact children have little real subjective personal interest in sex until the pubescent years. While most boys know something of such a subject before this time, which they have picked up in the street or at school from older boys, it is of little real interest to them. Before the pubescent years curiosity as to the "difference between boys and girls," "where babies come from," and the like, is aroused and questions of this nature will be asked; but these are usually of passing momentary interest and do not call for any special education or explanation. This is not a real interest in sex. The segregation at home and at school for children of school age is accepted by the child unthinkingly as a rule, as are most customs. Attempts to teach sex education by means of flowers and animal life in the early years is usually quite futile in so far as it has a personal reaction upon the child or that he applies it to himself. Undue emphasis before this time is apt, as it has frequently done, to lead to undue or abnormal curiosity in such matters and to self-consciousness before the time nature mapped out for the development of sex instincts. On the other hand, to treat sex matters as something to be concealed or as taboo is decidedly the best way to develop harmful ideas. The proper time for specific sex education is when nature shows that this phase of an individual's life is beginning to develop and it is indicated by the appearance of the secondary sex characteristics.

Instruction at this time must be emphasized along certain points. In girls the chief factor is the preparation for and a knowledge of menstruation. It is essential that the girl should not be kept in ignorance of the approach of this phenomenon. Its unexpected development may cause an emotional reaction with serious consequences, as experience has unfortunately shown. Moreover, it is most important that the girl should be taught to look upon menstruation as a

normal physiological reaction and except that it necessitates her minimizing physical effort by giving up athletics, parties, etc., she should not be allowed, unless the condition is irregular to a pathological degree, to consider herself as ill or sick or to let it interfere with her usual school and home routine unless these entail, in the individual case, excessive extracurricular work. Later the full importance and significance of sexual relations should be explained without undue stress being placed upon the physical side.

With boys the sex instinct or urge is stronger, and boys almost without exception have a much wider range of sex knowledge than girls. Much of this is apt to be sordid and erroneous. When a boy approaches puberty, a year or so later chronologically than the girl as a rule, he should be frankly told the truth in regard to sex matters and relationships. The chief fault in discussing such matters with boys is to confine the subject to a purely physical basis. The broad basis of sex, the relationship in the home of the father, mother, and children, the companionship of interests involved and the like should be stressed. On the physical side the points to be stressed are the facts of nocturnal seminal emissions being a normal physiological phenomenon and not "lost manhood," and the subject of masturbation as an unmanly, asocial action, and not as a cause of insanity—an act of the feeble-minded rather than as a cause.

But explain things as one may one cannot get away from the fact that the sexual instinct for reproduction is one of the primary instincts of life from a biological standpoint and cannot be eliminated by will or education. What should be taught is its control. Fortunately, as we have suggested before, there are other instincts and interests developing at this period and the most practical method of keeping the sex instinct in control is by encouraging the fullest development of these other instincts to hold the interest and attention of the child. The most important one for this purpose is the interest in physical development, and hence games and athletics furnish the most satisfactory substitute interest. The gang or herd instinct may be fostered until it takes up a large part of the child's time by such activities as the Boy and Girl Scouts, the Junior Y. M. C. A., and kindred organ-

izations. Religious consciousness, which is another development of pubescent years, is a help in many instances.

The question often comes up as to who will explain these changes to the boy or girl. If the father and mother have had the proper relationship with the boy and girl the parents are undoubtedly best suited to discuss such matters. If, as frequently happens, there has been a strained, uncompanionable relationship this becomes a difficult matter. The broad, finer side of sex relations cannot be emphasized in a bickering household. A relationship to discuss such things must be based on a companionship of confidence, trust and respect over years and cannot be established in an interview. Sometimes a teacher or the physician, if he has had the relationship with the children he should have had, is the logical person to talk with the child. The author is not in accord with the propaganda of sex education in the school but considers it primarily a subject of the home.

The subject of venereal disease should not be brought up with the boy until after puberty; at this early age the subject should be kept at a higher plane. Many of the mental derangements have their origin in the early adolescent years and the boy and girl must arrive at these years in a normal way. Sex development and differentiation is one of the dominating features of the pubescent period and cannot be ignored, as there is no other subject in which ignorance may lead to such disastrous results.

Health Education.—By health education we mean the teaching of proper habits conducive to health. A child absorbs unconsciously a great deal of health education if it is brought up properly and intelligently. There has been a distinct effort in recent years, however, to give a more definite training in health habits, particularly during the early habit-forming years, so that health habits become a more or less automatic reaction on the part of the child. Various psychological methods have been devised to interest children and to make more or less of a game of health. It is a matter which requires interest and coöperation of teachers and parents. Health alphabets with easily remembered health maxims for learning the letters in place of the old "A stands for apple," etc., health songs, dramatizing health truths, health clubs, forms for graphic records to interest the

child are some of the methods used to teach health habits and make them easily remembered and more or less of an unconscious guide to healthful living. How much value there is in this and how much fad is difficult to judge. It is unquestionably of aid but will never take the place of intelligent medical supervision.

Much of this work has been through the instrumentality and efforts of the American Child Health Association. An example of their literature is the "Rules of the Game" for young children:

A full bath more than once a week.
Brushing the teeth at least once every day.
Sleeping long hours with windows open.
Drinking as much milk as possible, not coffee or tea.
Eating some vegetables or fruit every day.
Drinking at least 4 glasses of water a day.
Playing a part of each day out-of-doors.
A bowel movement every morning.

There is at present an intelligent effort being made to place health education in the schools through the health education of teachers. This is the only method which offers anything of fixed or permanent value.

SECTION II

THE PREVENTION OF DISEASE

CHAPTER VII

MORBIDITY AND MORTALITY IN INFANCY AND CHILDHOOD

In order to discuss the prevention of specific diseases or conditions it is necessary first of all to have a knowledge of the various causes of morbidity and mortality in infancy and childhood and of their relative importance. While extensive data are available in regard to mortality, statistics relating to morbidity are limited in large part to the reportable communicable diseases, and there is reason to believe that such data are inadequate and incomplete. The incidence of many of the diseases common or peculiar to the age of childhood varies markedly from time to time in different localities. We do possess considerable data in regard to the age incidence of certain diseases and our actual knowledge of morbidity is limited in large part to this phase.

Childhood presents a complicated problem when we discuss the subject of mortality as it contains the two extreme peaks or limits of the mortality curve. In the first year of life we have the most dangerous period, and in the 10- to 14-year-old period the time when the mortality curve of the life cycle reaches its lowest ebb. In the following table the deaths per 1000 deaths by age, for the United States Registration Area in 1922, is shown.

TABLE XIV

DEATHS BY AGE PERIODS TO NINETEEN YEARS

Age	Deaths per 1,000 Deaths	Remarks
Under 1 year	143.9	14.3 per cent of total
1 to 2 years	27.2	.....
2 to 3 years	12.5	.....
3 to 4 years	8.1	.....
4 to 5 years	6.3	.....
Under 5 years	198.	19.8 per cent of total
5 to 9 years	21.2	Average of 4.2 annually
10 to 19 years	15.6	Average of 3.1 annually

Expressed in another way we may say that out of every 1000 deaths which took place in the United States in 1922, 144 were of infants under one year of age, and only 3 occurred in children at any age between the tenth and fourteenth years. One-fifth of the total deaths in the United States are in children under 5 years, but only one-fifteenth in children from 5 to 10 years. Thus we find at one extreme of the age limits of the period which is included under the general term of pediatrics, a time when mortality reaches its highest point, and hence a time at which preventive medicine, so far as the reduction of the death-rate is concerned, has its most opportune field. At the other extreme is the period of life when the death-rate is the lowest and prevention is of least importance so far as mortality is concerned.

ANTENATAL MORTALITY

It is difficult to obtain exact figures in regard to the frequency of miscarriages, abortions, and stillbirths, as not only is it impossible to obtain accurate and complete statistics, but the rate varies according to the race and social status of the material studied. It can be said quite definitely, however, that at least 1 in every 5 or 6 pregnancies ends before or at birth with a nonliving child. Census reports relating to stillbirths show a rate of approximately 4 for every 1000 living births. It is hardly within the scope of this book to enter into a discussion of this subject, except to point out its importance to the problem as a whole. While beyond question many abortions are in one way or another induced, a large number may be considered as preventable, as they are the result of environmental conditions. This may be due to the economic status of the pregnant woman who for one reason or another works beyond her capacity, or the result of a lack of medical supervision during the period of pregnancy. The methods of the prenatal centers where groups of women have been watched closely from the medical standpoint during pregnancy have shown that it is possible to reduce the number of stillbirths 30 to 40 per cent. Closely bound up with this subject of antenatal mortality is the question of neonatal mortality. Approximately 1 in every 5,

or 20 per cent, of the deaths in the first year of life has prematurity as its background.

In order to point out the importance of preventive medicine in the field of antenatal mortality the subject of syphilis may be used as an illustration. Thirty per cent of the pregnancies in syphilitic families end in death at or before term. The infant mortality rate in syphilitic families it between 250 and 350. Even with the best available medical and social treatment a large percentage of the living syphilitic children cannot be cured and belong permanently to the class of socially unfit and dependent. The only satisfactory treatment of inherited syphilis is the treatment of the pregnant syphilitic woman, as is shown strikingly by the figures of Williams, which have been confirmed in a number of clinics.

TABLE XV

EFFECT OF TREATMENT OF PREGNANT SYPHILITIC WOMEN ON MORTALITY AND MORBIDITY OF OFFSPRING

Number of Patients with Positive Wassermann Reaction	Extent of Treatment	Percentage of Children Dead or Presenting Some Evidence of Syphilis
157	no treatment	52
103	partial but inefficient treatment	37
163	satisfactory and thorough treatment	7.4

As will be shown in the discussion of infant mortality, a large part of the infant deaths occur in the first few weeks of life and any attempt to lower this early death-rate must be based upon the care and protection of the unborn infant. Not only is prenatal care and protection necessary in relation to the death-rate, but if infants and children are to thrive and develop normally they must be brought into the world in a strong and healthy condition.

INFANT MORTALITY

The high death-rate during the first year of life has attracted the attention of many public health workers and investigators and there is a large amount of information available as the result of numerous

studies relating to the various aspects of the situation. Not only is the infant mortality rate important because of the information it has furnished regarding specific causes of death, but the infant mortality rate as a whole has come to be regarded as the most sensitive index we possess of the general health, sanitation, intelligence, and economic level of community or even larger political units, as a state or a nation.

While mortality rates are usually stated in terms of the number of deaths at a certain age, or from a certain disease, to the total number of deaths, or at the rate per 1,000 deaths, in infancy we have become accustomed to use a specific rate, the infant mortality rate, which is the number of deaths in the first year of life per 1,000 living births. This implies an accurate registration of births as well as deaths. While the death registration area of the United States at the present time comprises about 90 per cent of the population the birth registration area is smaller, and in 1923 included about 75 per cent of the population. Infant mortality rates, therefore, are based on this latter area.

For a number of years there has been a steady decline in the infant mortality rate. While there are a number of factors responsible for this improvement—social, economic, and educational—it is a thing in which the medical profession as a whole may take an honest and just pride, as the decrease in one way or another has been in large part due to their efforts. This decrease has taken place in nearly every civilized nation and is well illustrated by the rates for England and Wales for 10-year periods, which average as follows:

Period	*Infant Mortality Rate*
1890-1899	153.2
1900-1909	132.3
1910-1919	102.6

The improvement in the United States has been parallel, but in the last few years the rate appears to have reached a certain level. The rates for the last six years for the registration area are as follows (the 1923 figures are the last available):

Year	*Infant Mortality Rate*
1918	101
1919	87
1920	86
1921	76
1922	76
1923	77

If these figures are analyzed it will be found that some communities, as a result of the type of population, situation, and intensive public health efforts, show figures below this rate. The specific factors influencing the rate will be discussed later. A typical curve of the decline which has taken place is the following graph of the infant mortality rate of the city of St. Louis:

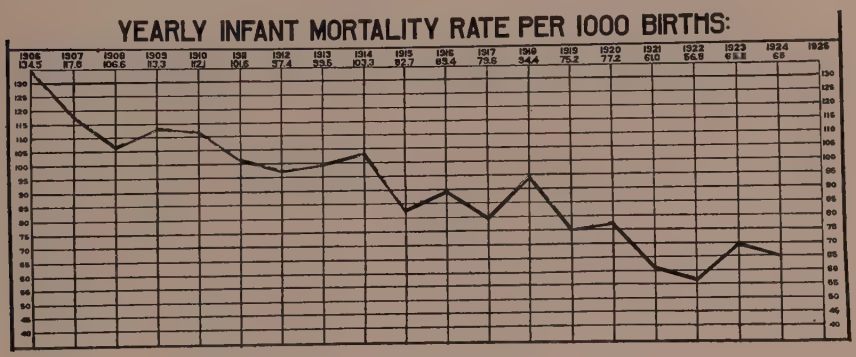


FIG. 7.—INFANT MORTALITY RATE, ST. LOUIS.

The curve shows the steady and marked drop in the infant mortality rate during the 18 years from 1906 to 1924.

It is most illuminating and instructive to consider the present infant mortality rate by the age of the infants at the time of death as shown in Table XVI.

It will be noted in this table that about 20 per cent of the deaths occur in infants before they are 24 hours old, 38 per cent in the first week and 51 per cent in the first month of life. The remaining half is divided over a period of 11 months. It is quite obvious that any important further reduction of the present infant death-rate as a whole is in large part dependent upon a reduction of this early neonatal

TABLE XVI

INFANT MORTALITY RATES FOR CERTAIN SUBDIVISIONS OF THE FIRST YEAR OF LIFE (UNITED STATES BIRTH REGISTRATION AREA, 1922-1923)

Age	1923	1922	Percentage of Rate for Year
Total	77.1	76.2	100
Under 1 day	14.7	14.9	19
1 day	4.4	4.4	
2 days	3.3	3.3	
3 to 6 days	6.1	6.4	
Under 1 week			38
2nd week	4.9	4.9	
3rd week	3.4	3.3	
4th week	2.7	2.6	
Under 1 month	39.5	39.7	51
1 to 2 months	6.4	6.2	
2 to 3 months	4.9	4.8	
3 to 5 months	11.2	10.7	
6 to 8 months	8.4	8.2	
9 to 11 months	6.8	6.6	

mortality. The infant mortality rate from birth injuries (in part preventable) and congenital malformations together amounted to 11 in 1923. If we subtract this from the deaths in the first week of life there still remains a figure of approximately one-fifth of the total number of infant deaths for the first week of life. These may be looked upon as in large measure preventable. In order to influence this death-rate, however, our methods must be directed to the prenatal life of the child and particularly to the prevention of premature birth. Public health methods of "prenatal care" have shown that it is possible to reduce this early death-rate some 50 per cent. Certainly this should be possible in private practice when the pregnant woman is under the care of a physician.

In Table XVII the infant mortality rate for the chief causes of death is shown. The rates for the years 1917 and 1923 are included in order to point out that the chief factor in the lowering of the rate is the decline of death due to diarrheal diseases. In 1917 the rate from diarrhea and enteritis was 20 and in 1923 only 11.3, a decline of approximately 9 from this one cause alone. The difference between the rates for the 2 years from all causes is only 16.9. If we compare the 1910 rate with the 1923 rate we find that the percentage of deaths due to the diarrheal diseases was reduced from 29 to 14, while at the

TABLE XVII

INFANT MORTALITY RATE FOR CERTAIN SPECIFIC CAUSES OF DEATH (UNITED STATES REGISTRATION AREA, 1917; SAME AREA, 1923).

Cause of Death	1917	1923
Contagion (Scarlet fever, Measles, Syphilis, Whooping-cough)	4.2	4.2
Influenza and pneumonia	5	5
Bronchitis and bronchopneumonia	10.5	9.1
Diarrhea and enteritis	20	11.3
Prematurity	19.1	17.9
Birth injury, Congenital debility	12.5	11.3
Congenital malformation	6.3	6.5
Total	93.9	77.3

same time deaths from congenital causes rose from 30 to 37, respiratory diseases 14 to 18, contagious diseases 4 to 5, and all other causes 21 to 26. As the percentage of deaths due to diarrheal disease has decreased as a result of an actual lowering of the number of deaths from this cause, the percentage of deaths due to other causes has necessarily increased, although as shown in Table XVII the infant mortality rate for these other causes has remained practically the same. In other words the lowering of the infant mortality rate which has taken place in recent years has been almost entirely the result of the decrease in deaths due to diarrhea and enteritis, and the rate for other causes has remained practically unchanged. As is well known the summer months furnished for years a "peak" in the infant mortality curve, due to the number of deaths from intestinal disease. As the infant mortality rate from this cause has been lowered the peak has flattened out.

In Figure 8 we have plotted the seasonal variation in the infant mortality rate as a whole for the year 1923 and for three of the chief causes of death. The summer months need no longer be considered as the most dangerous season for the life of the infant, as the mortality rate as a whole is lower at this time than during the winter months. The diarrheal diseases still show a summer peak, but it is overshadowed

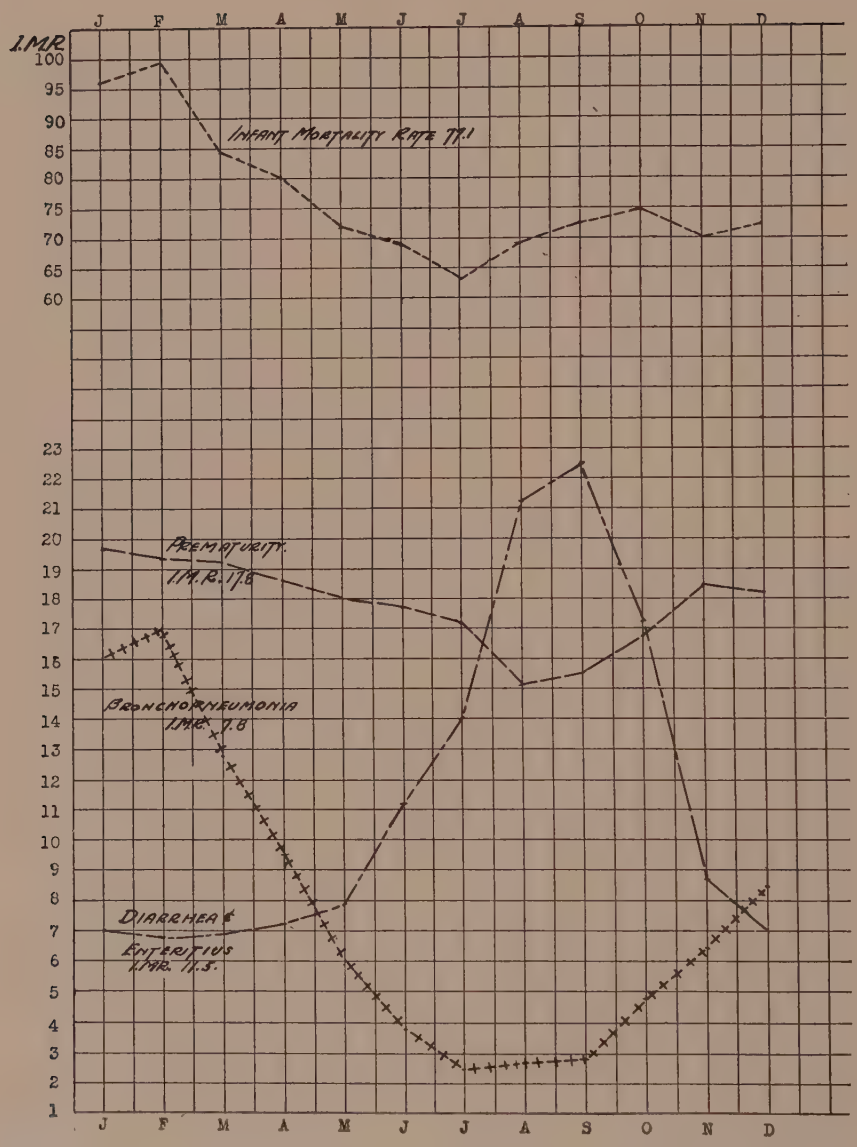


FIG. 8.—CHART SHOWING SEASONAL INCIDENCE BY MONTHS OF THE INFANT MORTALITY RATE.

(1) As a whole; (2) From prematurity; (3) From bronchopneumonia with high rate in winter months; (4) From diarrhea and enteritis with peak of curve in summer. Despite the summer peak of deaths from enteritis the rate as a whole is highest during the winter months.

in the rate as a whole by the importance of respiratory infections as a cause of death.

So far we have been discussing the infant mortality rate as a whole, based upon nearly eighteen hundred thousand births. When we analyze this rate by political subdivisions and communities we find the rate shows wide variations. Thus in 1923 the rates by states extended from Nebraska, Washington, and Oregon with rates of 57, to South Carolina with 96, and Delaware with 104. Near the mean rate we find such widely separated states as Massachusetts with 78, Indiana 71, Wyoming 80, and California 73. That this difference is not simply the question of a rural and urban population is shown by the urban and rural rate for the entire registration area.

TABLE XVIII

INFANT, URBAN, AND RURAL MORTALITY RATES FOR REGISTRATION AREA, 1921-1923

Infant Mortality Rate	1921	1922	1923
Total	76	76	77
Urban	78	80	78
Rural	74	72	76

If we analyze the rates by communities we find much greater differences in the rates. This is shown in the following table published by the American Child Health Association for infant mortality rates in 1923.

TABLE XIX

CITIES WITH LOWEST AND HIGHEST INFANT MORTALITY RATES, 1923

LOWEST RATE		HIGHEST RATE	
Birth Registration Area	Rate	Birth Registration Area	Rate
Cities with Population of over 250,000			
Seattle, Wash.	49	Pittsburgh, Pa.	98
Portland, Ore.	53	Washington, D. C.	92
Minneapolis, Minn.	54	Buffalo, N. Y.	90
Cities with Population of 100,000 to 250,000			
Spokane, Wash.	48	Lowell, Mass.	110
Yonkers, N. Y.	59	Richmond, Va.	110
Oakland, Cal.	63	New Bedford, Mass.	105
Grand Rapids, Mich.	63		

Lowest Rate		Highest Rate	
Birth Registration Area	Rate	Birth Registration Area	Rate
Cities with Population of 50,000 to 100,000			
Berkeley, Cal.	41	Charleston, S. C.	150
Long Beach, Cal.	41	Manchester, N. H.	117
Tacoma, Wash.	48	East St. Louis, Ill.	108
Cities with Population of 25,000 to 50,000			
Pasadena, Cal.	37	Winston-Salem, N. C.	142
Oak Park, Ill.	37	Asheville, N. C.	134
Alameda, Cal.	40	East Chicago, Ind.	124
Cities with Population of 10,000 to 25,000			
Santa Cruz, Cal.	26	Goldsboro, N. C.	161
Winchester, Mass.	26	Cairo, Ill.	155
Huntington, Ind.	30	Ogdensburg, N. Y.	142

These differences are due to many factors: type and character of population, racial differences in population, economic and social variations in different communities, density of population, character and scope of the public health work in the community, and specific efforts which have been made to lower the infant mortality rate.

Factors Influencing the Infant Mortality Rate.—So far we have been discussing the infant mortality rate as a whole and from a purely statistical aspect. It was pointed out that different communities show a wide variation from the mean or average rate. There are a number of factors underlying or influencing the specific rate which may be grouped together as economic and social. "Ignorance and poverty" have frequently been stated to be the chief factors underlying a high infant death-rate and in a broad sense this is true, as the two usually go hand in hand. Some excellent studies have been made by the Children's Bureau of the way in which the economic status of the family affects the death-rate. It has been shown, for example, that there is a direct relation between the rate and the question of family income. In the survey and study made in Johnstown, Pennsylvania, it was found that the rate for a family income under $521.00 a year was 155.7, and for an income of over $1200.00 a year only 84. This same general relationship to income has been found in all similar studies

made subsequently. The importance of housing and overcrowding has likewise been pointed out. In the Akron, Ohio, survey, the mortality rate for the number of individuals in the family per rooms in the house was as follows:

Number of Persons per Room	*Death-Rate*
Less than 1 person	55.1
1 person, but less than 2 persons	125.9
2 persons, but less than 3 persons	170.2

Other economic and housing relationships, as, for example, the difference in the rate depending upon whether or not there was a bathroom in the home, have been studied and classified. These are all expressions of the level of living into which the infant is born and lives, and which in turn goes back largely to the question of the economic level and that of the family income. It can be stated as a general rule that the higher the intelligence and the larger the income of the family the better will be the condition of the home and environment and the lower will be the infant mortality rate.

The subject of the employment of the mother is important in that it is a factor decidedly influencing the infant death-rate. From what has been said in the previous paragraph it might be thought offhand that the added income from the mother's earnings would lower the rate. It has been found, however, that whatever might be gained in this way is offset by an increase in the antenatal and neonatal mortality rate. There is also a difference as to whether the mother is employed away from or at home (at some gainful occupation besides housework).

The effect of employment upon the rate as a whole and the early rates in particular is summarized in the following table from studies of the Children's Bureau.

TABLE XX

Effect of Maternal Employment upon the Infant Mortality Rate

Working Condition of Mother	Infant Mortality Rate	Stillbirths, per cent	Neonatal Deaths, per 1,000 Births	Premature Births
Mother employed away from home	176.1	4.9	63.2	6.1
Mother employed at home	114.6	3.5	36.7	3.5
Mother not employed	98	3.1	43.1	5.2

A number of states have passed laws forbidding the employment of mothers at gainful occupations from 2 to 4 weeks before confinement, and from 4 to 6 weeks afterward. None as yet has followed the plan and custom of some of the European countries of compensating the mother for the time she is prevented, by an act of legislation, from working.

Race is an important factor and communities with a large colored population, a group as a whole poorly housed and of a low economic level, show much larger rates than cities without an important negro element. The infant mortality rate for colored and white in the registration area for the last 3 reported years was as follows:

TABLE XXI

INFANT MORTALITY RATE FOR WHITE AND COLORED POPULATION OF REGISTRATION AREA, 1921-1923

Rate	1921	1922	1923
Total area	76	76	77
White	72	73	73
Colored	108	110	117

Among white children there is a further variation in the rate according to the country of birth of the mother. Thus the mortality rate in 1923 for infants of white native-born mothers was 69.2, while infants of mothers from Norway, Sweden, and Denmark showed the lowest rate, 58.6, and infants born to Polish mothers the highest, 101.

The age of the mother is also a factor. The rate for infants with mothers under 20 years of age is the highest, and it is lowest when the mother is in the twenty-fifth to twenty-ninth year age period.

Illegitimacy is a decided handicap from the mortality standpoint, as the death-rate for illegitimate babies is from 3 to 4 times as great as that of infants born to married parents. The figures for illegitimate births for the United States are low and there is a question as to the accuracy and value of the statistics of illegitimate births. There is no question, however, as to the high infant mortality.

While many other factors might be discussed, they are more or less added evidence to the general statement that poverty and ignorance lead to a high infant mortality rate.

There is one important factor that must be discussed and that is the classification of the infant mortality rate according to the type and character of the infant's diet. Statistics show that only a relatively small number of breast-fed infants die and that 75 to 80 per cent of the infant deaths occur among those who are artificially fed. This difference becomes more marked when we consider that a majority of infants are breast-fed. Statistics gathered from all parts of the world show that 90 per cent of the deaths due to diarrheal diseases are in bottle-fed babies and only 10 per cent in breast-fed. Bottle feeding is not only the result of social and economic factors, ignorance, poverty, illegitimacy, and the like, but all too frequently has a certain "medical" background, as has been pointed out in Chapter IV.

A typical study of the importance of breast feeding on the infant mortality rate is the following of 1,451 babies at the age of 3 months. Of these 1,355 were alive, showing a low general mortality rate. Classified by groups according to feeding the results were as follows:

TABLE XXII

EFFECT OF TYPE OF FEEDING ON MORTALITY RATE OF 1,451 INFANTS TO THREE MONTHS

Type of Feeding	Alive Three Months	Deaths	Infant Mortality Rate
Breast	987	46	46.6
Breast and bottle	175	18	57.1
Bottle	193	32	165.8
Total	1,355	96	....

If any important reduction in the number of deaths during the first year of life is to be made a number of factors must be taken into consideration. These may be summed up as follows:

1. Improvement in the housing and general level of living as a whole, or in other words, economic and social improvement.

2. The better care of the pregnant mother, economically and medically, to reduce prematurity and lessen the high neonatal mortality.

3. The maintenance of breast feeding—a problem of better medical and nursing supervision as well as a not infrequent educational and economic problem.

4. Education in the hygiene of infancy, using this term in its broadest sense.

The methods which must be used in bringing about such improvement from the medical standpoint are the methods of preventive medicine and pediatrics which we are discussing. To discuss the social and economic problems and their solution is beyond the scope of our subject, but we must realize that there is a decided limitation to the results which can be obtained by medical measures alone.

MORTALITY AFTER THE FIRST YEAR OF LIFE

Following the high mortality of infancy a rapid decrease takes place in the deaths at each period, as was shown in Table XIV. In 1922 there were 155,766 deaths under 1 year in the registration area and only 29,389 in the second year of life. Rates are no longer figured in a specific way as the infant mortality rate but according to the deaths per 1,000 deaths or 100,000 of population.

As the age periods increase there is a gradual change in the chief causes of death and the relative importance of the causes. In the second year approximately 30 per cent are due to the epidemic contagious diseases and the same number to respiratory diseases. Only 20 per cent are due to the diarrheal diseases and the importance of this last cause decreases rapidly from this time on. In the third and fourth years about 40 per cent of the deaths are the result of the contagious diseases, and 25 per cent are due to respiratory infections. In the 5-to-9-year period the causes begin to be more diversified and general, and conditions such as cardiac disease and appendicitis become important factors. In the 10-to-14-year period the infections begin to lose their importance. As children grow older accidental deaths come to play an important part in the list of causes of death. Automobile accidents are becoming more and more of an important factor in mortality tables. In Figure 9 the relative importance of different diseases as a cause of death in early childhood is shown.

There are two changes which must be stressed in the mortality after the first year. The first is the importance of the infectious diseases in mortality figures. Preventive measures, as will be discussed more in

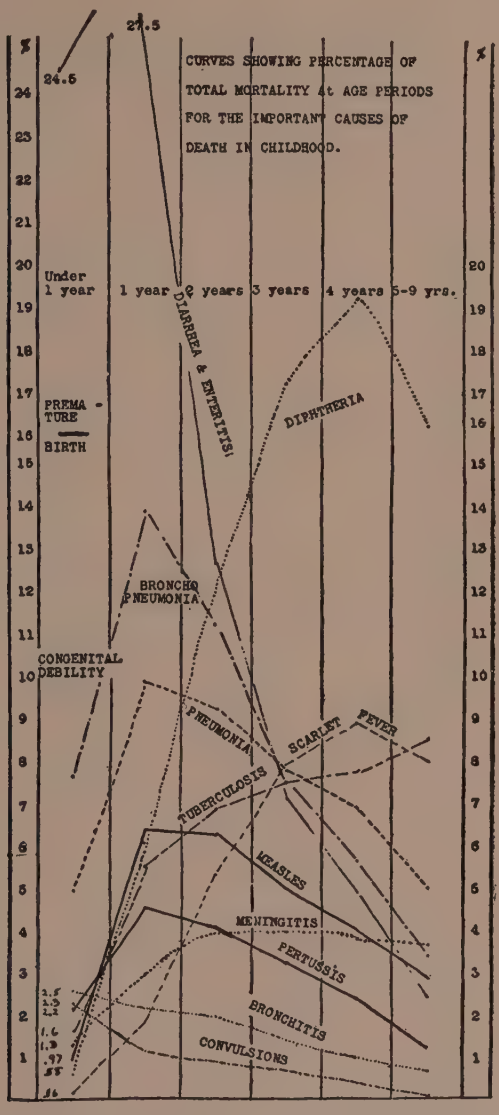


FIG. 9.—THE PERCENTAGE OF DEATHS DUE TO DIFFERENT DISEASES BY AGE PERIODS IN CHILDHOOD.

detail in the following chapter, must depend upon the development of specific biological methods of immunization if any important decline is to be made in the rate from these diseases. The second is the fact that the lower the infant mortality rates for a given community the lower the rates for succeeding years. Measures directed to the preven-

tion of infant mortality do not lead to an increase in the death-rates in children of preschool and school age, but to a lowering of these rates.

MORBIDITY IN INFANCY AND CHILDHOOD

In contradistinction to the fairly exact figures which are available regarding mortality, statistics relating to the frequency of different types of diseases or illness are incomplete and decidedly inaccurate. Most morbidity statistics relate in one way or another to a selected group of material. Records in regard to the frequency of this or that condition have only been kept in connection with certain "reportable" communicable diseases, as scarlet fever or diphtheria. When one compares the number of reported cases of a communicable disease with the number of fatalities attributed to the same cause on the basis of the disease fatality rate, it is usually found that far too few nonfatal cases have been reported. Rates of incidence based upon the mortality rate give inaccurate and misleading figures, as the case fatality rate varies in different epidemics and often in different localities at the same time. Hence a discussion of morbidity must pass over the general question of the frequency of the disease as a whole, and is more or less limited to a discussion of the types of disease at different age periods.

In infancy the chief problem centers around nutrition and hence nutritional problems form the most important group of diseases which are encountered at this period. Not only do we find specific nutritional conditions as rickets, but indefinite acute and chronic digestive disturbances. In the first 6 months of life the specific infectious diseases aside from intestinal infections are uncommon. From then on their incidence increases rapidly month by month.

The preschool years and the first 2 school years are characterized by the frequency with which the specific infections are encountered. Not only do we find the epidemic, communicable diseases, but the more nondescript infectious colds or upper respiratory infections are responsible for a large part of the illness of this age period. It is an age also when physical defects which may injure the health of the child to a greater or less degree are prone to develop. Surveys of large groups of preschool children show a large percentage as malnourished,

dental caries rampant and chronic nose and throat infections exceedingly common.

As the child enters the school-age period the infections are common for a year or so and then their frequency decreases rapidly. Likewise there is a steady decrease in the extent of malnutrition at each advancing age period. As the children grow older and puberty approaches, a steady increase is found in the incidence of rheumatic and cardiac disease which is uncommon before the fifth year. It is at this time also that a steady increase occurs in the number of children with defective vision as a result of nearsightedness. Approaching puberty goiter becomes prevalent, particularly in certain areas or districts. At the adolescent period psycopathic traits begin to develop, although these may have been present for years and only become more pronounced at this time.

The tendency toward age incidence and the age relationship of many more conditions might be discussed, but this leads us into the realm of medicine and our object is only to point out that the prevention of disease at different periods of childhood must be constructed along different lines of attack. In the two following chapters many of these conditions are discussed more in detail from the standpoint of prevention.

CHAPTER VIII

THE PREVENTION OF SPECIFIC DISEASES

In this chapter we have grouped together brief discussions of what we know in regard to the prevention of specific diseases or conditions which are peculiar to or common in infancy and childhood. No attempt has been made to discuss general hygiene, sanitation and the like, which are thoroughly discussed in numerous textbooks on hygiene and preventive medicine, but only to bring out the importance of these conditions to the general subject of preventive pediatrics. With the exception of a few deficiency diseases and one or two metabolic conditions the subject of the prevention of specific diseases is almost entirely bound up with the infectious diseases and particularly those which are grouped together as "communicable diseases."

Rickets.—Studies of the last few years have thrown a great deal of light upon our knowledge of rickets. We no longer think of rickets as the extreme type of clinical picture described so clearly by Glisson many years ago, but recognize that early or mild states or conditions of the disease are extremely common and may be demonstrated by roentgenograms long before ordinary clinical evidences are apparent. Rickets may be defined as a nutritional condition in which there is a faulty mineral metabolism resulting in a delayed or retarded deposition of calcium salts. It is further known that the disturbance is in the blood serum and that the phosphorus metabolism is deranged as well as the calcium metabolism. It has been known for years that cod-liver oil is preventive as well as curative for rickets, and it has been shown that there is an antirachitic accessory food substance or vitamin in cod-liver oil which influences the mineral metabolism. This same vitamin is present in egg yolk, fresh vegetables and milk to a greater or lesser degree. The action of this vitamin, vitamin "D," is not clearly understood. It has also been demonstrated that exposure to sunlight or artificial light containing ultra-violet rays will inhibit the

development of rickets. The exact action of light is uncertain, but it has been suggested that in some way the rays form antirachitic vitamin from the cholesterol of the skin.

In order to prevent rickets, of which frequency in mild forms and the importance of its relation to the nutrition of the infant are just beginning to be appreciated, attention must be given to a number of matters. First of all the pregnant and nursing mother must receive a well-balanced diet with plenty of green vegetables and there should be a certain amount of milk in her diet.

While the infant does not show obvious clinical rachitic changes until it is several months old, the metabolic disturbance producing these changes has been present for some time and the clinical picture of obvious rickets must be regarded as an advanced or late stage. Hence preventive measures must be begun early. In addition to milk, either mother's or cow's milk, green vegetables are started as early as the fifth month as a matter of routine. In order to be certain that there is sufficient antirachitic vitamin in the food to lead to proper mobilization of the mineral salts, cod-liver oil should be started in early infancy, by the end of the first month, and continued as a part of the routine diet until the end of the second year. We have no definite information as to the minimum quantity of oil which is necessary to prevent rickets, and this is a figure which in all probability varies considerably in different infants and according to season and environment. As a rule from 20 to 30 drops twice a day in early infancy is sufficient in our St. Louis experience. This should be gradually increased until at 8 or 9 months about 2 drams daily are being taken. In addition to the routine use of cod-liver oil in the diet, the yolk of one egg is added to the diet in the latter part of the first year.

Light is an important preventive factor and it has long been known that winter (dark) months favor the development of rickets and that out-of-door life inhibits its development. While it is wise to begin in early infancy to expose the infant to the direct rays of the sun (not sunlight through the ordinary window glass) and to continue this daily, it is not always a practical or possible method and hence most reliance must be placed upon the use of cod-liver oil. There is no question but that sunlight aids general metabolism as well as having

a specific antirachitic prophylactic value. The length of exposure must be short at first and gradually increased. Burning of the skin must be avoided and skins vary in their sensitiveness to sunlight. Moreover, exposure to intense southern sunlight must be shorter than to the less intense northern light. For these reasons it is difficult to lay down fixed rules as to the length of exposure. Artificial light may be used in winter but is rarely necessary or practical as a routine preventive measure in private practice. Care should be taken that the cod-liver oil contains a sufficient quantity of the antirachitic vitamin, as different oils vary in this factor and some oils have been found to be quite inert. At the present time a number of tested oils are on the market which are quite satisfactory.

Scurvy.—Scurvy belongs to the group of deficiency diseases. For a number of years it has been recognized that some substance must be present in the diet to prevent the development of scurvy and in recent years this has been termed the antiscorbutic vitamin. Although the exact chemical nature of this substance is unknown it has been found to be present in many food stuffs, as breast and cow's milk, in potatoes and green vegetables, in citrus fruits as oranges, and in many other fresh fruits. Clinically it has long been recognized that most cases of infantile scurvy develop among artificially fed infants and only exceptionally in those fed on the breast. The majority of infants who develop scurvy, moreover, have been fed on proprietary foods with a high carbohydrate and a low milk content. There has always been considerable controversy and discussion as to the use of boiled and pasteurized milk in the etiology of scurvy and it has been shown that the antirachitic vitamin is sensitive to heat and is fairly easily destroyed by prolonged temperature. The type of fodder used also influences the quantity of the antiscorbutic vitamin in cow's milk. As the boiling or pasteurization of milk used in infant feeding is quite a universal custom to-day to protect against bacterial infection of the intestinal tract, it is quite necessary to add antiscorbutic vitamin to prevent the development of scurvy. Although scurvy manifests itself in the latter half of the first year as a rule, minor or early changes are found before this time and clinical scurvy is more or less of a cumulative process. Therefore, beginning in early infancy, it should be made a part of the

routine feeding of the infant to add the antiscorbutic vitamin to the diet. In America orange juice is quite universally used for this purpose. One or two teaspoonfuls daily beginning in the first month and continuing until the infant is on a diet of green vegetables and raw milk is sufficient for this purpose and affords ample protection. In place of orange juice, tomato juice (commercially canned) offers a satisfactory substitute. Somewhat larger quantities should be given. This custom of adding antiscorbutic vitamin has become so universal that scurvy, even in its mild forms, is rarely encountered to-day.

Simple Goiter.—Simple goiter is of frequent occurrence during the pubescent years. Not only is it endemic in certain areas, as the region of the Great Lakes and the Pacific Northwest, but sporadic cases are common outside of these goiter regions. While earlier studies of incidence pointed out that there were 6 cases in girls to 1 in boys, and this statement is usually found in texts, more recent studies have indicated a much higher incidence among boys and a much closer proportion between the sexes. Large simple goiters, however, are much more frequent among girls and only occasionally encountered among boys.

It has been found that when the percentage of iodin in the thyroid gland is less than one-tenth of one per cent of the total gland tissue, hypertrophy (simple goiter) develops. The incidence of simple goiter follows closely the iodin content of the water in different areas and when there is a low iodin content, as in the region of the Great Lakes, simple goiter becomes endemic. These facts have led to the use of iodin salts for prophylactic purposes.

Studies made by Kimball and Marine in the schools of Akron, Ohio, in 1917, showed that it was possible to control the development of simple goiter by the routine administration of iodin salts to school children between the ages of 11 and 16. Since this time the use of iodin salts as a public health measure to prevent simple goiter has been taken up in many parts of the world and splendid results have been reported from all sides. Iodin may now be regarded as a practical specific in the prevention and control of simple goiter.

In the early work sodium iodid was used, but this has been discarded to a large extent because of its taste and an organic iodin

compound which is stable has been found more satisfactory. This has been combined with chocolate into a tablet by several manufacturers and is a most agreeable form of giving iodin to children. Each tablet contains from 3 to 10 milligrams of iodin and one tablet once a week is sufficient to supply all the iodin needed and hence prevent the thyroid hypertrophy. While the earlier work was limited to children from 11 to 16 years we not infrequently see simple goiter as early as the ninth or tenth years and hence the use of iodin tablets may well be started at an earlier age than 11. In private practice it is advisable to watch children carefully from the tenth year on, and in goiter regions to begin the routine administration of iodin at this time, or even earlier.

Most interesting public health experiments have been started in goiter regions in an attempt to iodinize entire communities. In Michigan a law has been passed requiring all salt sold for cooking and table purposes to contain a certain per cent of iodin. As nearly all table salt from inland salt deposits is iodin-free, this is added in the form of potassium or sodium iodid. In Rochester, New York, the city water supply is iodinized twice a year. The value of such mass measures cannot as yet be determined, and hence, so far as the individual child is concerned, the physician should rely on the routine, weekly use of some form of preparation containing iodin.

Cardiac Disease.—Congenital heart disease is a prenatal developmental defect and nothing can be done in the way of prevention. There is no evidence of hereditary transmission.

Acquired heart disease in childhood is the result of some infection. Either directly or indirectly the portal of entry of the infection is the upper respiratory tract in the vast majority of cases. The hygiene of the nose, nasopharynx, mouth, and throat, therefore, is of greatest importance. The subject of tonsils and adenoids and their removal is discussed in another chapter and need not be repeated, except to emphasize the necessity of clearing up infected foci in the upper respiratory tract in children with cardiac disease to prevent reinfections. The interrelationship of chorea, arthritis, tonsillitis, and cardiac disease is one of the best known syndromes in pediatric medicine. Either of the first two calls for a thorough investigation of the upper respiratory tract and a removal of any infected foci, as tonsils or infected nasal

sinuses. One attack predisposes to a recurrence and the danger of a cardiac complication exists as long as the source of infection remains. Statistics show that cardiac disease is frequent among children and it is estimated that the total number of cases in the United States is nearly a million. The effect of heart disease (endocarditis) upon the individual is dependent upon the extent to which it interferes with the normal circulation and the capacity of the heart to respond to unusual demands. A child with a valvular lesion may have no difficulty in living the life of a normal child and enter a normal useful maturity, and on the other hand the child with decompensation and a hopeless prognosis is an all too common patient in our hospital wards. While it is difficult to prevent infection and the development of cardiac disease in the individual child, a great deal may be done to prevent the child with cardiac disease from having a break in compensation. First of all, measures should be taken to prevent a reinfection by eliminating the focus of infection. Secondly the life of the child with cardiac disease should be arranged and planned to prevent overstrain. This is not at all a simple matter and it is far more difficult than with the adult regardless of the severity of the lesion, for several reasons: First, there is the question of the physical growth and development of childhood which places a strain upon the heart which cannot be avoided. This is particularly true of the pubescent years when growth is so rapid and the heart normally doubles its size to meet the increasing circulatory demands. This is a dangerous period for the child with cardiac disease. Secondly, childhood is the age period of the incidence of communicable disease and intercurrent infections are common causes of a break in compensation in patients with heart disease. Thirdly, we have to consider the fact that we are dealing with a child whose natural instinct is to play and romp. An adult will realize the danger of physical overstrain and lead a quiet life, but it is extremely difficult to prevent a child, who may feel perfectly well, from jumping rope, running, playing ball, and the like, to excess. The life of the individual child with heart disease must be carefully mapped out and constantly supervised. The best criterion of the cardiac condition is the state of the general nutrition, and this serves not only as the best guide to the severity of the lesion (in its effect upon circulation)

but also as to the degree of activities which may be allowed. What we must try to prevent, in the average case of cardiac disease, is a break in circulation from physical overstrain or infection. Cardiac decompensation in a child has but one prognosis, but if a child can be carried through puberty into adolescence without a break the chances are favorable for a useful adult life.

The Communicable Diseases.—Under this rather loose term we have grouped together those of the acute infectious diseases in which the chief and usual mode of transmission is by direct contact. While at times certain of these diseases may be transmitted through inanimate objects, this is not the important method of transmission. Most of these diseases are usually referred to as "diseases of childhood" in that their incidence is chiefly during this period. This is not due to any particular attribute of the infectious agent of the disease, but simply because in childhood we find a population susceptible to infection. Most of these infections confer an almost absolute immunity against a second invasion, hence their infrequency in adult life. When an adult population has not been rendered immune in childhood, the ravages of these "children's diseases" is as great among adults as among children, as shown by the classical illustration of the epidemic of measles in the Faroe Islands in 1846 when 6,000 out of a population of 7,782 were attacked.

These diseases are only exceptionally seen in infants in the first half year of life, as usually there is a passive immunity during this period, transferred to the infant during its prenatal life from the mother through the placental circulation. This immunity begins to disappear, as a rule, in the fifth or sixth month, as shown by the increasing incidence of these diseases during the latter half of the first year. This can also be demonstrated by direct tests of immunity, as the Schick test for diphtheria. For reasons of which we have no definite knowledge or satisfactory explanation at present, there is a marked difference in the degree of susceptibility to the different infections. Thus nearly everyone is susceptible to measles and only a small percentage of individuals to anterior poliomyelitis (perhaps this is not a direct contact infection), while the susceptibility to scarlet fever and measles lies between these extremes. There is also reason to consider

hereditary phenomena of susceptibility and immunity. Certain families seemingly have a tendency toward certain infections, and certain races which have long been exposed to certain infections, as the Ghetto Jew to tuberculosis, seem to acquire a certain hereditary resistance or immunity. The virulence of the infectious agent of the disease may vary considerably at different times and in different epidemics. Thus smallpox in one epidemic will be mild and without fatalities and at another time, or in some other locality at the same time, will have a high mortality rate. The relation of the general health of the individual to the invasion of specific infections is an uncertain one. Probably it has little to do with specific resistance but rather is a question of a better reaction to the infection. Thus measles and mumps had a high incidence among the non-immune recruits in the army, although they were selected subjects from the standpoint of general health.

The prevention of the communicable diseases has been developed along two distinct lines of attack: First, by the control of exposure through isolation and quarantine of individuals with the diseases, and, second, by biological methods with the purpose of immunizing a susceptible individual against a specific infection by means of active and passive immunization.

How much value and how much worthlessness there is in isolation and quarantine it is difficult to say. Like fumigation after an infectious disease, segregation has been so widely used as a public health method that its value is usually accepted without thought or question. And yet we know fumigation may be largely dispensed with. Despite the fact that isolation and quarantine have been carried out for years, in as thorough a way as it will ever be possible, in all probability, the incidence of some of the communicable diseases, as measles and diphtheria, has not decreased as a whole. Further, there is no proof that the decrease in those diseases whose incidence has decreased is due to isolation and quarantine, or is anything more than the tendency of the infectious disease to be cyclic in incidence—an observation which goes back to the early medical writers. Theoretically it is logical to prevent the spread of the communicable diseases by isolation during the infectious periods. Practically such isolation is not possible except in unusual circumstances, as many of the diseases are

infectious before the development of specific symptoms by which the nature of the infection can be recognized. The arbitrary period of quarantine then imposed—the locked barn after the horse is gone—is often nonsensical and not of the slightest value. Consider measles for example. For a day or more before the eruption the infection resembles an ordinary "cold." This is a highly transmissible period of the disease. Then the eruption appears and the patient is isolated and quarantined for 2 weeks as a rule. In the usual case the infection is no longer transmissible after the temperature goes down and the rash fades. Here isolation is started too late and quarantine continued when unnecessary. When one comes to consider the way in which the communicable diseases continue year after year in more or less the same frequency or cycle of frequency, one is forced to conclude that they will not obey man-made laws (isolation and quarantine) but that their control is found only in nature's laws (immunization).

The control and prevention of the communicable diseases by biological methods is a field in which modern medicine has a just pride. We have pointed out that most infants possess a passive immunity during the early months of life, a provision of nature in preventive medicine without which the human race would probably die off. It has been found that after this early immunity has been lost, it is possible to immunize against many of the infections by the use of human blood serum of individuals convalescing from the specific infection. This passive immunity is soon lost and the method has so many practical difficulties that its use is chiefly restricted to checking the spread of the infectious diseases among children in institutions. A serum for passive immunization against some diseases, *i.e.*, diphtheria and scarlet fever, may also be obtained by immunizing some species of animal. In addition to the temporary duration of such immunization, it has the further objection of frequently sensitizing the individual to the foreign protein of the serum of the animal used, and hence such sera, as a rule, are better for curative than prophylactic purposes. More important for prophylaxis is the production of an active immunization in an individual by the use of some form of a toxin of a specific infection, or by an attenuated infectious virus. Thus the epoch-making discovery of Jenner in smallpox, and the recent work in

diphtheria and scarlet fever. The principles of active immunization in the control and prevention of the communicable diseases of childhood are known. The problems of bacteriology and immunology still offer one of the most attractive fields of investigation open in pediatrics, for in large measure the control and prevention of the communicable diseases depend upon biological methods.

Upper Respiratory Infections.—Acute infection of the upper respiratory tract, the common cold, forms one of the most important conditions encountered in pediatric practice. Not only are the common colds responsible for an enormous part of the illness of childhood, but in infants and among children below par physically, they may be the start of a series of events which not infrequently end in death. The balance against recovery in the case of a malnourished infant is often the result of an intercurrent respiratory infection. The extension of infection from the nose and throat to the ear, and in turn to mastoid involvement, and the establishment of acute and chronic infections of the paranasal sinuses and the relation of these to arthritic, nephritic, and cardiac disease are well known. In hospital practice the necessity for rigid isolation and separation of infants and children with colds is recognized.

We must recognize first of all that they are infections which are highly contagious as a rule and are spread by direct contact. Hence our chief method of prevention in childhood consists in efforts to prevent exposure. Children under school age contract upper respiratory infections, as a rule, from some member of their household—parents, older brothers and sisters, caretakers, or servants. In older children we have not only the direct household environment but, in addition, school contacts. The amount of time lost in school attendance during the early school years because of colds is appalling, and is greater by far than the time lost because of "contagious diseases." While infections frequently take place in school, the school is not wholly at fault. In a school with which the author is in touch with health conditions there are more absentees from colds the first two days of the school week than the last two, suggesting that infection is more common out of school than at school itself. Infants and young children should be kept as much as possible from closed, crowded

spaces, as street cars, movies, and the like, as these are unquestionably common and frequent sources of exposure. Every effort should be made by teachers and school medical authorities to prevent the coughing, sneezing child with an upper respiratory infection from remaining in contact with the other children. At home older children with colds should be kept from infants and younger children. Parents should always be on the lookout for colds occurring among servants and nurses, as altogether too many infections are transmitted to children from this source.

The general resistance of the child is an important factor in limiting the number and severity of the infections. Hence hygiene is of importance. Exposure, chilling, fatigue, and the like predispose toward infections by increasing the susceptibility of the child toward the invasion of bacteria. There is no specific bacteriology of the upper respiratory infections. Clinically the character of the infection changes from time to time and frequently the infection travels in epidemic waves. Preventive therapy based upon immunization by organisms is of a "shotgun" variety. While prophylactic immunization mixtures against "colds" are used by many physicians, their actual value is extremely difficult to determine. Occasionally one sees what are apparently strikingly prophylactic results from their use, but in most instances they are seemingly of little value in preventing the upper respiratory infections.

Diphtheria.—The use of diphtheria antitoxin in the treatment of diphtheria has been one of the most valuable methods of modern medicine and it has materially decreased the mortality of the disease. Unfortunately statistics show there has been little if any decrease in the incidence of the disease in the past 10 or 15 years. This, we know, is due to the presence of "carriers" who, while immune themselves, pass the infection along to susceptible individuals. While passive immunity to diphtheria may be produced by the injection of small doses of antitoxin to exposed individuals, it has not influenced the incidence of the disease as a whole. The immunity thus induced is only temporary and has the added disadvantage of frequently sensitizing the individual to horse serum.

Real progress in the prevention of diphtheria had its beginning

in the discovery of the toxin test by Schick and the working out of a practical toxin-antitoxin mixture by Park and his associates subsequent to the introduction of the Schick test. The Schick test depends upon the fact that if an individual has not less than 1/30 of a unit of antitoxin in each cubic centimeter of his blood he possesses a natural immunity. Schick found that if 1/50 of the dose of diphtheria toxin necessary to kill a 250-gram guinea pig was injected into the skin it would be neutralized if the individual had a natural immunity, but that if there was no natural immunity the toxin acted as an irritant and produced a local reaction. By means of the Schick test it has been found that there is a marked variation in the susceptibility to diphtheria at different age periods. Under 3 months but from 10 to 20 per cent are susceptible, at 6 months 30 per cent, and then a rapid increase takes place to 60 per cent or more at a year. Between 1 and 2 years of age the susceptibility reaches the highest point of around 75 per cent. A gradual decrease takes place from this time on, until at 10 years only around 30 per cent of children are susceptible. Zinger has pointed out that the percentage figures for susceptibility vary widely and according to the environment of the individual. Thus in congested districts, where the population lives in close contact, the percentage of immunity is much higher than among individuals living in less densely congested areas or in rural districts. In clinic work negative reactions are quite frequent among children, but in private practice they are only exceptionally encountered. The Schick reaction is not as simple a procedure as it sounds and not infrequently the findings are invalidated by poor technic. Extreme care must be exercised in its application. The toxin mixtures used are very unstable and many negative Schick's have been reported in susceptible individuals.

Based upon some earlier work of Von Behring, Park of New York and his associates have been perfecting a method of active immunization against diphtheria by means of a mixture of toxin neutralized with antitoxin. At first a 3 L plus mixture was used and more recently a 1/10 L plus mixture, as it was found that the same degree of immunity could be produced by the smaller dose and almost all of the local reaction avoided, which at times was severe with the larger dose. The 1/10 L plus mixture is now obtainable through commercial houses.

One or two unpleasant occurrences have resulted through the use of improperly prepared mixtures. More recently, at the meeting of the American Medical Association in 1924, Park and Zingher reported work using a toxoid instead of a toxin. Apparently as good an immunization can be produced as with the 1/10 L plus toxin mixture and the possibility of any unfortunate occurrence can be obviated. Three injections of toxin-antitoxin are given from 1 to 2 weeks apart and in the vast percentage of cases (over 95 per cent) immunity results. This may develop in a few weeks after the injections but frequently not until the tenth or twelfth week. In our health clinics in St. Louis Schick tests are not made again until at least 3 months after the injections are completed. A few children have to be re-injected.

So far, as a public health measure, active immunization has largely been used with school children and in New York City alone over one hundred thousand school children have been immunized. If one studies morbidity and mortality statistics it will be found that over 65 per cent of the deaths from diphtheria are in children below school age. If the incidence of diphtheria is to be materially lowered and the mortality rate markedly influenced, active immunization must be practiced before the school age. Only a small percentage of infants can be reached through institutions or clinics where public health measures can be used *en masse,* so to speak, as is possible with children in schools.

In private practice the prevention of diphtheria by active immunization is a procedure squarely up to the physician. The means are available and one might almost say that the medical profession as a whole can be judged of its attitude toward preventive medicine by the use it makes of active immunization. The time that the infant should be immunized is between the sixth and the tenth month. This extends the protection over the most dangerous period so far as the mortality is concerned, and from a practical standpoint it is far easier to give the injection to an infant of this age than to an older infant or a child of 2 or 3 years of age. Since in private practice negative Schick tests are so infrequent at this and older ages, a preliminary Schick test may be dispensed with and every infant should be considered as susceptible and given diphtheria toxin-antitoxin.

Scarlet Fever.—Scarlet fever is less common than measles, whoop-

ing-cough, and diphtheria, and seemingly has a lesser degree of transmissibility. It causes fewer deaths than measles or whooping-cough and less than half as many as diphtheria. It is a disease of later childhood and its death distribution by age is similar to that of diphtheria. Its incidence and death-rate in infancy are less than of any of the other serious contagious diseases of childhood. It is, however, dreaded because of the serious nature of its complications and sequelæ.

For many years the constant association of the streptococcus with scarlet fever has been known and numerous attempts have been made to bring this into etiological relationship. A number of efforts have been made to treat and to prevent scarlet fever by use of an anti-streptococcus serum by Marmorek, Moser, and others, and although these have had a slight temporary and limited vogue they have gradually been discarded. The opinion gradually became current, and is the teaching of most textbooks on the subject, that the rôle of the streptococcus in scarlet fever was that of a secondary invader and that the streptococcus was not the causative agent.

Within the last two years there have been some epoch-making studies which give promise of being to scarlet fever what diphtheria antitoxin and toxin-antitoxin have been to diphtheria. In 1919 Dochez and Avery found that streptococci from the throats of scarlet fever patients were in general of a specific type which could be distinguished by certain biological relations. Later Dochez and Sherman announced that they had been able to produce a disease in guinea pigs with certain streptococci which had some of the picture of scarlet fever. Dochez advanced the theory that the streptococci in the throat in scarlet fever elaborate a toxin which is absorbed and produces the rash and general symptoms, similar to the way toxin is produced and absorbed in diphtheria. A horse was immunized with hemolytic streptococci obtained from cases of scarlet fever and the serum used by Blake, who has reported favorable results in the treatment of the disease. It has also been used for purposes of passive immunization in individuals exposed to scarlet fever. More important, however, from the standpoint of prevention, is the work of the Dicks, which has been going on at the same time. The Dicks, who have been working on scarlet fever for a number of years, announced in 1923 that they had produced scarlet

fever in 2 of 11 volunteers by swabbing the tonsils and pharynx with a pure culture of hemolytic streptococci obtained from the throat of a patient with typical scarlet fever. Later they made a filtrate from their cultures and found that the filtrate contained a toxin which, when injected into the skin of an individual not immune to scarlet fever, gave a reaction analogous to the Schick test for diphtheria. This has been used to test the immunity to scarlet fever. Repeated injections of small doses or the injection of a large dose of the toxin has the power of producing immunity to scarlet fever and has been used for this purpose in a small series (July, 1924) of well-controlled individuals, who have been exposed to the disease in their daily hospital work. Park and his associates have found that immunity can be produced by the toxin in about 2 weeks, but by the end of 9 months a large percentage of those immunized have lost the immunity. The value and the limitations of the Dick test and of active immunization by small, controlled doses of toxin is yet to be determined. The prospect of a method for the prevention of scarlet fever is most promising.

Numerous attempts to prevent scarlet fever as well as to treat the disease by the use of convalescent serum have been made. Some investigators have reported encouraging prophylactic results but the method has never been widely taken up and it presents a number of practical objections and problems which make it questionable if its use, no matter how valuable it might be, could ever be much of a factor in the control and prevention of the disease.

Measles.—Measles is perhaps the most highly infectious of the communicable diseases and but few children escape infection. Statistics show that about 7.5 per cent of the cases occur in infants under 1 year of age and about 12 per cent for each age period between the first and seventh years. The mortality, however, is largely in the first 2 years of life. The importance of this mortality figure is accentuated when one considers that measles rarely occurs under 6 months of age, a passive immunity being present during this time if the mother has had measles, as is the case with so many of the communicable diseases. The lesson to be drawn from the mortality figures is that infection with measles should be avoided or postponed as long as possible. Death in a large proportion of cases is due to pneumonic

complications and hence the mortality in infancy and in debilitated children is high.

The exact cause of measles has not been discovered, but Anderson and Goldberger have shown that it is a filterable virus. Further, we know that the highly infectious period is that of the catarrhal stage before the rash has appeared. After the rash has developed and the temperature has fallen the infectiousness is slight. Almost without exception transmission is by direct contact, the few exceptions being transmission by an intermediate person.

The prevention of measles by notification and quarantine by health officers has been a decided failure. Diagnosis is not made as a rule before the rash appears, as in the majority of cases a physician is not called before this. Even in those cases where the diagnosis is made earlier from Koplik's spots before the skin eruption, the child is well into the infectious stage and has usually transmitted the disease to all susceptible individuals with whom it has been in contact. Rigid individual quarantine applied to susceptible indivduals exposed to measles for a period of 2 weeks may check the spread, but this method is only practical in an institution. To quarantine measles patients for 2 weeks after the rash has developed, as is done in the vast majority of cases, has never as yet checked an epidemic, and measles once started usually goes on its way until the vast majority of susceptible individuals have been attacked.

Without a knowledge of, or the isolation of, the causative agent *active immunization* against measles is not possible (except as shown in recent work discussed below). Passive immunization by means of serum from convalescents has had some measure of success but it has certain practical difficulties which render it questionable if the method will or can be of general use. For purposes of passive immunization from 60 to 80 cubic centimeters of blood are taken from a convalescent measles patient a week after defervescence. The serum is separated and a Wassermann test made. Some tricresol is added as a preservative and usually the serum from several patients is mixed together. The injection of 5 cubic centimeters of this serum intravenously will usually confer a passive immunity for 6 to 8 weeks. If a susceptible individual be exposed to measles the serum must be injected not later

than 4 days after infection has taken place. The difficulties of obtaining serum, its preservation and distribution are obvious. Its value at present is largely restricted to child-caring institutions. It is in these institutions, however, that epidemics of measles are particularly dreaded, owing to the number of contacts and to the usual inferior physical condition of institutional children. More recently Hermann of New York has been using a method of active immunization, the value of which is yet to be determined. Based on the fact that most infants whose mothers have had measles have a passive immunity to measles up to fifth or sixth month, Hermann has attempted to add an active immunity by producing a mild measles infection before the passive immunity is entirely lost. Some of the nasal discharge from a case of measles in the preëruptive or catarrhal stage is taken and mixed with a saline solution. After cleaning by centrifugalization a few drops of the solution are applied to the mucous membrane of the nose of the infant, as near as possible at the end of the fifth month of age. Frequently between the eighth and sixteenth day a slight elevation of temperature occurs and even a few spots develop. Hermann reports that of 165 infants so inoculated there were no unfavorable effects and that 45 subsequently were directly exposed to infection and not one developed the disease. The value of the method is yet to be confirmed. Its importance lies chiefly in preventing measles among infants, the age period, as pointed out, when the disease is most serious from the standpoint of mortality.

Chickenpox.—The etiological factor is unknown. The disease is highly infectious in character but is usually very mild and rarely accompanied by serious complications. For this reason practically no effort has been made along preventive lines to control its development and spread. It has been demonstrated that the contents of the vesicles contain the infectious material and that it is possible to immunize children by inoculating them with this material in a manner analogous to the early method of inoculating against smallpox. As the disease is mild this has never been put into general clinical use. Passive immunity can also be conferred by using the serum from the blood of convalescent patients who have just recovered from chickenpox.

Rubella; Exanthem subitum; Fourth Disease (Duke's Disease).—

These diseases are all comparatively infrequent and are mild in character. The infectious agent in all three is unknown and no attempts or experiments have ever been made in the way of preventive therapy.

Smallpox.—Smallpox is the classical illustration of the value of preventive medicine. Once a disease which was one of the scourges of mankind, it today is a comparatively unimportant factor in our morbidity and mortality reports. Through the neglect of vaccination as a result of carelessness and the opposition of faddists there has been a tendency toward an increase of the disease in the United States in the last decade. In California, since the repeal of the vaccination law, there has been a marked increase in the incidence of smallpox. In 1922, over 56,000 cases of smallpox were reported in the United States and nearly 900 deaths. These were all preventable. The story of vaccination and of Jenner's early work has been told too many times to justify its repetition. It is a chapter of medical history with which every physician is familiar.

It is not necessary, moreover, to go into the question of vaccine virus or vaccines, as a discussion of these is available in any standard text on medicine. Today satisfactory virus can be obtained from practically every manufacturer of biological products. The vaccines are tested and examined regularly by the United States Government (Public Health Service) and manufacturing licenses are issued annually after reinspection. The glycerinated virus is almost exclusively used.

There are several methods of vaccination in use. Scarification, the earlier method of vaccination by cross-incisions, is no longer used. The preferable method is either by placing one or two drops of vaccine on the prepared skin surface and making a linear incision through each drop with the point of sterile needle and then rubbing the vaccine in, or by making a few punctures through a drop with a needle. The needle point is carried obliquely into the deeper layer of the skin, not subcutaneously, and the virus is carried along with the needle. The latter method produces the smallest scar and the lesion produced is least likely to undergo secondary infection. The deltoid region of the arm is the preferable site for vaccination in infants and children. When the leg is used the site should be the outer surface of the calf of the

leg and not above the knee on the thigh. The leg should be used as little as possible during the height of the take.

The physician should make it a rule to vaccinate all infants under his care near the end of the first year and earlier if there is smallpox in the community. Not infrequently several vaccinations are required in infancy before a take occurs. If the first vaccination does not take a second should be made in about 2 weeks. Care should be taken to be sure the vaccine used is giving takes in nonimmune cases. If the second vaccination does not take it is the author's practice to repeat the vaccination at intervals of 3 months until a take is obtained.

One of the most perplexing questions is the matter of revaccination after a take. Certainly all children should be revaccinated on entering school (primary vaccination should not be put off until this time when it is compulsory by legislation in nearly every state) and whenever smallpox makes its appearance in a community. The vast majority of revaccinations will not take but will show an immune reaction. This is the development of a small papule at the site of vaccination in 24 hours which disappears rapidly and does not go on to vesiculation. Many individuals show this reaction throughout childhood following the primary successful vaccination. In a small percentage of individuals, in from 5 or more years after the primary vaccination, a retake will occur. Formerly considerable attention was paid to the size and character of the vaccination scar. This, however, is unreliable as indication of immunity, as the older scarification method produced much larger scars than the puncture method used to-day. One can never err on the side of revaccinating too frequently. If a retake occurs it may be regarded as indication of a loss of previous immunity and susceptibility to the disease. If an immune reaction occurs it causes no distress or discomfort to the patient. In other words everything is to be gained and nothing is to be lost through frequent revaccination.

Pertussis.—Pertussis is an excellent example of the failure of isolation and quarantine measures to prevent the spread of an infection. The difficulty in early diagnosis is frequently a part of the clinical picture of the disease. While the causative organism, the Bordet-Gengou bacillus, is known, biological measures of immunization are far from being perfected. While some writers attribute considerable suc-

cess to immunization for prophylactic purposes other reports are quite discouraging. Failure to develop the disease after exposure and immunization is sometimes erroneously attributed to the vaccine, as frequently nonimmunized children are exposed and fail to develop the infection, and on the other hand the failure of immunization in many instances may be attributed to the fact that the infection has already been transmitted before the vaccine is given. Satisfactory studies of the duration of the immunity obtained from a vaccine are lacking. It has been shown that many of the so-called "pertussis vaccines" were not in reality made from the pertussis bacillus. The autogenous vaccines are seemingly of much greater value than the ordinary stock vaccines prepared by commercial manufacturers of vaccines. The dosage of the vaccine should be larger than the one usually advised.

Mumps.—Very little has been done in the way of prevention of epidemic parotitis, except the usual isolation and quarantine. It has been shown that the disease may be due to filterable virus and Wollstein has obtained the virus from the salivary secretion. Hess in 1915 reported the intramuscular injection of serum from patients convalescing from mumps into a small group of institutional children who were exposed to the disease during an epidemic. None of them developed the disease. Mumps is most frequent during the early school years. In childhood it is an extremely mild disease as a rule and complications are unusual. Orchitis only exceptionally occurs before puberty. Epidemics of mumps in young adults in military camps, colleges, and institutions may be very severe and disabling, and for this reason many physicians regard mumps in childhood as a fortunate occurrence, as one attack usually confers immunity.

Anterior Poliomyelitis.—We know practically nothing in regard to the prevention of anterior poliomyelitis. It is an acute generalized infection occurring both sporadically and in epidemics. Experiments of Flexner, Rosenau, Amoss, and others, have shown that the cause is a filterable virus, which it is possible to transfer from one monkey to another by introducing the virus directly into the central nervous system, and through injections into the peritoneal cavity or intravenously. The virus has been grown as minute globoid bodies by

Flexner and Noguchi, and Rosenow has reported a small micrococcus which he considers the etiological organism.

We have no positive knowledge of the method of transmission and without this, methods of prevention are matters of opinion and guesswork. The occurrence of the disease in epidemics, which have apparently been more frequent in recent years, has led to the view that the disease may be transmitted directly from person to person. Against this is the frequency of isolated sporadic cases and the fact that the disease has been treated in open hospital wards for years without secondary cases developing. Advocates of the direct contact transmission theory consider healthy carriers as playing an important rôle in the transmission of the infection. Others look upon the infection as insect borne, and Rosenow and Brues have transmitted the infection from one monkey to another through bites of the stable fly. One of the most satisfactory explanations of the peculiarities of the disease is the view that the disease is an exceedingly common one, but that only in exceptional circumstances, as periods of unusual virulency of the virus, is the central nervous system invaded with the resultant paralysis which characterizes the disease as we know it from a clinical standpoint. Unfortunately this is purely a theoretical consideration.

As the method of transmission is unknown the application of preventive measures is largely groping in the dark. During epidemics at least the disease should be isolated but the period of quarantine is entirely a matter of guesswork. The use of antiseptic gargles and washes, which have been recommended, is of doubtful value, particularly as Flexner and Amoss have shown that the normal mucous membrane is itself highly protective against the infection.

Tuberculosis.—In discussing tuberculosis in childhood we must distinguish between infection with the tubercle bacillus and tuberculosis as a clinical disease. By means of tuberculin reactions it has been found that many children have been infected with the tubercle bacillus and react positively to tuberculin although no clinical evidence of the disease can be demonstrated. The frequency with which such infection is found varies with the type of material studied. Urban children show a greater frequency than rural, and children in congested city districts show a higher incidence of infection than children in the

better and more sparsely settled residential areas. In St. Louis Meredith Johnston and the author obtained the following figures from dispensary and hospital material.

TABLE XXIII

INCIDENCE OF TUBERCULOSIS IN 1,130 CHILDREN TO FOURTEEN YEARS

Age	Total Number of Children	Percentage Positive
Under 1 year	202	1.5
1 to 2 years	109	5.5
2 to 4 years	163	19
4 to 6 years	172	23
6 to 8 years	152	29
8 to 10 years	126	30
10 to 12 years	107	34
12 to 14 years	99	28

The relation between such infection and infection producing clinical tuberculosis is an important one but one that is complicated and not wholly understood. There is no positive answer to the question as to why some children handle the infection and why others develop the disease. Some consider the question of dosage most important and others stress factors of individual immunity and susceptibility. Age is a factor, as the younger the age at which the child is infected the more apt the disease to develop. No definite history of exposure can be obtained in the vast majority of children who show simply a positive reaction to tuberculin, while in a majority of the cases of active tuberculosis in children there is a definite history of exposure to known cases of phthisis. Another important but unsettled question is that of the relation of childhood infection to the tuberculosis of later life. On the one hand is the view that infection practically always occurs in childhood and that the tuberculosis of later life is a lighting up of this process, and on the other is the question as to whether an early infection does not give more or less of an immunity. With all our knowledge of tuberculosis certain of these fundamental questions are unsettled.

In infancy and childhood we further have to consider the type of tubercle bacillus and the manner of infection. Both the human and bovine type are pathologic for man. In children with tuberculosis Park and Krumwiede found the following distribution:

TABLE XXIV

DISTRIBUTION OF HUMAN AND BOVINE TYPE TUBERCULOSIS TO TEN YEARS

Age	Human Type	Bovine Type
Under 5 years	292	76
5-10 years	131	46

Figures from different countries give somewhat different proportions. In general it may be said that the human type gains entrance to the body through the air and the bovine through the alimentary tract. For this reason preventive measures directed against infection must be developed along two lines of attack. Infection with the bovine type is in large part due to infection through milk. This is one of the reasons for the frequency in childhood of tuberculosis due to the bovine type of bacillus. In order to limit this form of infection there must be a rigid control of dairy herds and the elimination of tuberculous cattle. In addition universal pasteurization of commercial milk is desirable. To prevent infection with the human type of organism young children must be taken away from an environment in which there is open tuberculosis. It is practically impossible to prevent young, romping children from becoming infected when living in immediate contact with open tuberculosis, despite the most rigid precaution on the part of the patient. The younger the child the more dangerous the infection to the life and health of the child. Hempelmann reported the following mortality rate for active pulmonary tuberculosis in young children in St. Louis:

Under 1 year.....78.7 per cent
1 to 2 years.....57.4 per cent

Infants were included only when alive at least one year after the diagnosis was made. In older children, when infection has become quite frequent, the same factors come into play in changing the disease from a quiescent or latent state to an active one as have been so well studied for early adult life. Undernutrition, overfatigue, and intercurrent infections are the chief factors in the lowering of the individual resistance against tuberculosis. Children who are underweight and undernourished are frequently spoken of as pretuberculous.

Children of this type should be given special attention for the purpose of bringing their physical condition back to par, and such measures as the open-air schools, preventoria, and the like are of decided aid in building up the resistance of the individual against the development of clinical tuberculosis.

The effect of intercurrent infections, particularly measles, is well known and the development of activity of many cases of tuberculosis can be traced directly to such infections. Children disposed to tuberculosis, and particularly those known by tuberculin tests to be infected, should be given opportunity to recover thoroughly from such intercurrent infections before starting on the normal, active life of the child.

Syphilis.—Syphilis is an important disease from the standpoint of preventive pediatrics, as not only is it frequently encountered among children, but it is one of the chief causes of fetal death. In 4,000 pregnancies reported by Williams of Johns Hopkins there were 302 fetal deaths of which 102 or 34.4 per cent were due to syphilis. In 372 families in which a syphilitic child was treated in the Children's Hospital Clinic in St. Louis there had been 1,463 pregnancies with 318 fetal deaths, or 21.7 per cent. In unselected material the fetal death-rate from all causes is about 10 per cent. In the remaining 1,145 pregnancies, 233 deaths had occurred among children born alive. How many of these deaths were due to syphilis is unknown, but in all probability a large part were influenced by the infection. Of the 912 living children 486 were known to have syphilis and only 54 were free of the disease. The remaining 372 were not examined. In 1921, 443 children with hereditary syphilis who had been treated during the period of 1912-1919 in the clinic and hospital, were reëxamined and studied by Park White and the author, and as a whole the results of treatment were most disappointing. Every effort had been made to follow up the luetic children during this time with nurses and special workers and a special clinic for their treatment had been installed. A large sum of money had been expended in clinic workers, hospitalization, medication, etc., and the results obtained could hardly be said to justify the expense and effort over this period of years, except as a matter of scientific investigation. Of a total of 308 patients of whom

we considered end-results, only 22 per cent were cured or recovered, and 43 per cent were unimproved or had died.

The treatment of hereditary syphilis is its prevention. By this is meant the treatment of the luetic mother before and during pregnancy. Williams has shown that this method leads to a reduction of syphilis transmitted during pregnancy from over 50 per cent to less than 10 per cent. If the luetic mother could be controlled and brought under treatment early, this last figure would in all probability be lowered. The difficulty lies chiefly in the ignorance and indifference of the social strata in which hereditary lues is chiefly found. As a part of the routine examination in prenatal clinics a Wassermann test should be made as soon as the pregnant mother can be brought in for examination and appropriate treatment given if the reaction is positive. Syphilis, as we now recognize, is a distinct community social problem. In the large cities the vast majority of hereditary lues is found among the class of society which is cared for by clinics and city institutions. While through intensive and long-continued treatment a certain amount of hereditary syphilis can be cured, our special effort and stress should be placed upon the prevention of the disease through the proper care and treatment of the luetic mother. Acquired syphilis with children is extremely rare and requires no discussion.

Gastro-Intestinal Infections.—The greatest progress that has been made in the lowering of the infant mortality rate has been due to the decrease in deaths from gastro-intestinal disease. As was discussed in the previous chapter, until a few years ago the curve of infant mortality charts showed an extremely high peak during the summer months which coincided with a tremendous increase in deaths due to gastro-intestinal disease. In some parts of the country, particularly in the small or rural communities in the South, the death-rate from gastro-intestinal disease is still excessively high. There has been extensive research and study of the factors which led to the high mortality from gastro-intestinal disease in summer. Much of this centered about the question of heat. It must be acknowledged now that whatever influence heat plays in the production of gastro-intestinal disease the action is either indirect or predisposing, as the incidence and mortality of the condition has markedly decreased while the

summers have continued as hot as ever. That the chief factor was and is still diet has always been obvious, from the single fact that over 90 per cent of the deaths were in artificially fed infants. Although the number of deaths has decreased markedly, the deaths at the present time are almost wholly confined to the artificially fed baby. The most important and essential method of the prevention of gastro-intestinal disease therefore is breast feeding, as breast feeding not only brings about a condition of general strength and resistance to infection in the baby, but obviates the chief source of gastro-intestinal disorders. We must look first of all then to the food of the artificially fed infant if we wish to prevent the diarrheal diseases, and this is chiefly milk and water. Milk undergoes rapid changes as a result of bacterial action and it is of course one of the best media for the growth of bacteria. In summer the problem of the milk supply and distribution becomes a difficult one, owing to the rapidity with which bacteria develop in milk at our usual summer temperatures. The milk may carry pathogenic organisms, as some one of the types of the dysentery bacillus, which directly bring about the diarrheal condition, or, as has been shown, the bacteria may produce toxins in the milk which are the cause of the disturbance. Undoubtedly the custom so common among the foreign population in our congested quarters of giving the babies improper food, as certain fruits, is a factor, but milk plays the most important rôle. The supervision over our milk supply and the movement for "clean milk" has undoubtedly played a part in lowering the incidence of acute gastro-intestinal diseases; but even with a most carefully supervised source, as "certified milk" dairies, milk has been known to carry infection. It is the belief of the author that the marked decrease in summer diarrhea has been chiefly due to the routine use of boiled milk in infant feeding. In a period of 10 years, summer diarrhea has become almost extinct in St. Louis, and this has paralleled the use of boiled milk in infant feeding. The earlier objections to the use of boiled milk on the grounds of its being a "dead food," and hence predisposing to scurvy and malnutrition, have been met with our newer knowledge of vitamins by the routine use of fruit juice or tomato juice and small amounts of cod-liver oil from early infancy on. The occasional constipating action of boiled milk is easily overcome by the use

of the more laxative forms of carbohydrate. It is a routine rule in the infant welfare stations in St. Louis, where a large number of babies from the poorer social classes are handled, to boil all milk fed the infant through the second summer. The incidence of diarrhea as well as the general mortality rate is lower in these stations than the death-rate for the city at large. All water given babies should also be boiled.

Beyond question a part of this reduction is due to the general improvement in the care and hygiene of babies which has taken place in recent years. In summer months and hot weather it is difficult to get rid of the body heat and mothers must be taught that if the baby is to stay well he must not be overdressed, but must be kept cool. An indirect factor, but one of great importance, is the continual year-round supervision of the infant. The infant who is susceptible to gastro-intestinal infection and disorders is the infant who is below par physically, and it is the infant with a low resistance and general body strength who succumbs so rapidly to the infection. The summer diarrhea problem may be summed up in a few maxims: Keep the baby on the breast. Watch its development throughout the year so that its resistance to infection is high and its strength normal. If it is an artificially fed infant get the cleanest and best milk possible and then boil it.

CHAPTER IX

MALNUTRITION

The subject of malnutrition in infancy and childhood is so broad in its scope, as the term is used to include all chronic forms of deviation from normal nutrition, that it is a matter of first importance in the field of preventive pediatrics. Malnutrition is not a disease, nor is it simply a question of a child being a certain percentage under the average weight of normal children for a given height and age. This must be firmly fixed in the mind, as so much has been written in the medical and lay press in regard to malnutrition and height-weight-age tables, and so many nutritional activities have been instigated by lay health workers upon this as a basis, that an erroneous conception of the meaning of the term is quite widespread. The following definition of malnutrition was formulated by the Medical Committee of the American Child Health Association and it states fairly well the correct meaning of the term:

"Malnutrition is what the word actually implies—bad nutrition. It requires a clinical consideration of the general aspect of the child as indicated by:

"1. Condition of skin and mucous membranes

"2. The condition of the muscles—whether they are properly developed and of good tone

"3. The bony structure

"4. The functional use of the muscles and skeleton as related to correct posture

"5. Weight, which includes the amount of subcutaneous fat as well as the bulk of the bones and muscles

"Height and weight tables are only of value in furnishing averages and indicating tendencies. They do not indicate what any given child should measure in height and weight as they are not an absolute index of nutritional status. Malnutrition is a clinical diagnosis which must rest on a total estimate of all contributing factors."

In other words malnutrition may be defined as the state or condition of abnormal nutrition, resulting from some one or a number of interrelated causes, manifesting itself by underweight, failure to gain the proper amount of weight, poor posture and muscular tonus, and lack of stamina, which may be associated with physical or psychological signs of impaired health. It may vary greatly in degree and may be important or relatively unimportant. As a general rule we do not include under this term the acute losses of weight and tonus accompanying acute illnesses, which are usually soon repaired, although acute illness is not infrequently the starting point of malnutrition. While malnutrition is usually looked upon and thought of as a condition of preschool and school children, it is a very common condition in infancy. In our discussion from a medical viewpoint this must be considered, although naturally many of the phases of malnutrition in older children, as postural defects, do not show in the infant. Moreover the time interval must be considered, for a period of one or two months in infancy is the equivalent of many months of growth in an older child. It is convenient to divide the discussion into these two age periods. Although our subject does not include treatment of diseases it becomes necessary at times to stray a little into this field. In order to prevent malnutrition a knowledge of the causes is necessary, and as certain physical factors or defects are among the causes, the proper management of these is essential in its prevention. These are only incidental and what we have to say should in no measure be regarded as a discussion of the treatment and management of malnutrition.

MALNUTRITION IN INFANCY

We have no exact knowledge of the extent of malnutrition among infants. Statistics taken from hospital clinics and private records show a wide variation in the percentage frequency. The picture of the malnourished infant may vary from that of a wasted, shriveled, dried-out infant whose nutritional condition is obvious to everyone, to one in which the signs of faulty nutrition are apparent only to the trained observer. Thus an infant of average or overaverage weight may show softness of the bones, or a lack of tonus of the muscles, slight rachitic

signs, etc., frequently overlooked, which are definite signs of faulty nutrition and often indicative of more marked malnutrition later on. These must be included under our conception of malnutrition, as the difference is only one of degree.

Malnutrition cannot be judged by the weight alone. Normal infants of the same age may vary several pounds in weight, as was discussed in the chapter on physical growth and development. Of more importance is the curve of the gain in weight, but what is essential is the physical examination of the infant.

The causes of malnutrition in infancy may be grouped as follows:

1. Congenital weakness or debility, including prematurity and congenital defects
2. Insufficient food and faulty diet
3. Chronic infections
4. The result of acute infections
   (*a*) Of the gastro-intestinal tract, or
   (*b*) Parenteral infections

It is difficult if not impossible to apportion the relative frequency or importance of these causes. They vary in different types of material and frequently two or more causative factors are interrelated. A prominent place must be given to the congenital causes and these are frequently of importance in so far as life and death are concerned, as shown by the high mortality rate of infants in the first few weeks of life. Prematurity plays a large part among the congenital causes. It is well known that the premature infant, who has to adjust himself to extra-uterine conditions of living before nature intended him to do so, is apt to have a hazardous journey through the first year, and the marks of this often are seen throughout childhood despite the best environment and care. The weight curve of the premature infant usually remains below that of the normal baby and the softness of his bones and tissues is apt to leave chest and cranial deformities. The prevention of prematurity lies in the domain of obstetrics, although it logically is a part of preventive pediatrics. Child hygiene has of necessity assumed "prenatal" work as a part of its function, as will be discussed in a subsequent chapter. Not only is the prevention of prematurity a medical problem, outside the scope of this text, but it

has wide social aspects and its solution depends not only upon better obstetrics and the more thorough supervision of pregnancy, but upon economic provisions for mothers before and after confinement.

A second congenital factor affecting the nutrition of infants is the presence of congenital anomalies, as harelip, cleft palate, pyloric stenosis, congenital cardiac disease, and the like, which are not preventable and which are definite medical problems interfering with normal growth and nutrition.

A third factor was discussed in the chapter on heredity—the inherited differences in tissue types and constitution. We know this to be a factor from clinical observation, but the knowledge of the etiology, classification, and prevention or correction is an untilled field. As to whether it is the result of germ-cell inheritance, or to the physical condition or the diet or mode of life of the mother is a matter of speculation.

The secondary group of causes of malnutrition is connected with the infant's diet. In Chapter IV a diet was outlined which will prevent malnutrition in so far as diet is a cause or factor. Breast milk is, of course, the best food, but it must be sufficient in total quantity. Very often there come under the observation of the physician breast-fed babies who are happy and contented and apparently perfectly normal to the mother, but who have gained but a few ounces in a number of weeks. Even with breast milk the diet may contain an insufficient amount of salts or vitamins and hence these must be provided for as outlined. The necessity of complementing breast milk by the fifth or sixth month has been pointed out. The danger of artificial nourishment in the production of malnutrition lies not only in the occasional inability of the baby to handle cow's milk but in the failure of artificial diet to furnish certain properties essential to normal growth and development. This is particularly true of proprietary foods. With foods of this type the total quantity of calories may be sufficient or even in excess, and hence large, husky looking, and, at times, overweight babies may develop when fed upon them, but careful examination shows pallor, anemia, and mild rachitic changes. Average weight or overweight is regarded erroneously as synonymous with good nutrition. The need of antirachitic and antiscorbutic substances

or vitamins must be provided for constantly when an infant is on an artificial diet. Improper feeding accounts for many cases of malnutrition in infancy, particularly when associated with infections.

Chronic infections, particularly syphilis, tuberculosis, and malaria, seriously interfere with nutrition. Malnourishment may be regarded as one of the important signs of these diseases, as it is so constant a part of the clinical picture. In hereditary syphilis the prognosis as regards life and death is almost directly dependent upon the degree of malnutrition.

Too little importance has been attached to the effect of the acute and subchronic infections upon the nutrition of the infant. Feeding has been overstressed in consideration of the relative importance of infections. The rapid loss of weight and the slow, difficult way in which infants recover from severe gastro-intestinal infection is well known. The story of how the baby was thriving "until he had diarrhea and since then has never been strong and well" is all too frequent. Even the mild forms of intestinal infections leave their mark and several weeks may elapse after the onset before the baby starts to gain. Such setbacks leave definite traces upon the nutrition and health. A few weeks in infancy is equal to a period of several months in later childhood and a disturbance at this time is of vastly more importance in retarding the normal growth and development than one at a later period of life.

Much less common is the realization of the effects of acute and low-grade subchronic and chronic parenteral infections. Many cases of "difficult feeding" brought to the specialist are in verity not dietetic cases at all, but are infants with unrecognized low-grade infections of the ear, upper respiratory tract, urogenital tract, and the like. The child who has failed to gain for weeks starts to gain and thrive as soon as the infection is located and eliminated. Such low-grade infections of the nasal and pharyngeal mucous membranes are frequently the cause of malnutrition and all the skilled dietetic treatment in the world will not improve the nutrition until the infection is overcome by the body resistance, or the focus of infection is found and removed. Even acute gastro-intestinal symptoms with a rapid loss of weight and the development of a dangerous situation may result from a parenteral in-

fection, as of the mastoid. The young growing organism of the infant is a delicately balanced mechanism and infections, even the most mild, derange the machinery and interfere with its normal working. The prevention of infection is almost of equal importance to the question of diet. The majority of infections which an infant acquires are from the immediate members of his environment. The physician can never overstress the danger of the mild household infections and colds and must reiterate the importance of this again and again to mothers and nurses. The same mother who would consider herself unnatural if she fed the baby from an unboiled bottle will again and again kiss and fondle the baby when she has a cold, or, worse, permit others to do so.

MALNUTRITION IN OLDER CHILDREN

Malnutrition in children of the preschool and school age is an exceedingly common condition. Its frequency is dependent upon the exact definition of and the measure used in defining the term. Too frequent use has been made of the rule of defining malnutrition as 7 to 10 per cent or more below the average weight for the height, as determined by the use of some standard height-weight-age table of averages. While it is true that the large majority of the children who are 10 or more per cent under these averages are malnourished, underweight and malnutrition are not synonymous. The use of height-weight tables has been of tremendous value in bringing the subject of health and nutrition to the attention of parents and teachers, and the 7 or 10 per cent rule serves as a rapid method of sorting out the majority of malnourished children. Moreover, the weighing and measuring of children is of vast psychological value in interesting them in the question of their own health and diet in a desirable way. But a diagnosis of malnutrition should only be made upon the basis of a complete physical examination by a physician. What is of value is the knowledge of the causes and their correction in the individual child. Unlimited wasted energy, well-meaning but misguided, has been spent by nonmedical health workers in attempting to correct malnutrition by dietetic methods alone, and erroneous conceptions are quite generally held by parents and teachers in regard to the meaning of the term.

As was pointed out in Chapter III, a child may vary considerably from average weights and heights and still be normal. Inherited racial characteristics for groups, together with inherited types of body habitus for individuals are determining factors for the normal height and weight of an individual. Every physician who has had experience with children has numerous records of well-nourished children 10 or more per cent below the average height-weight, and of malnourished children near or above the average weight. The diagnosis cannot be based upon weight for height alone and we refer for the essentials of diagnosis to the definition in the beginning of this chapter. The physician experienced with children makes a diagnosis of malnutrition or its absence without the use of the scales, and uses the scales and height-weight tables as a measure of confirmatory aid, but not as a basis of diagnosis.

The frequency of malnutrition varies according to the type of material studied and the age. While considerable malnutrition is found among the children of the well-to-do, it is more common among children of the less favorably situated economic groups. This is due both to the environment and to the better medical care which children of the more favorably situated are apt to receive. If we go into schools or groups of the same social and economic strata, we find much more malnutrition among children in early than in later childhood, even if no group corrective measures have been taken to improve conditions. Thus a public school will frequently show from 20 to 25 per cent at 6 years and only 10 per cent at 10 years. This shows that a certain percentage of the malnourishment in young children tends to improve or correct itself. In a school for boys from 9 to 16 years where the pupils are of a type who have had good medical attention since birth, the percentage of malnutrition over a number of years has been around 4 per cent and this chiefly among the younger boys. In a mixed school for children from 5 to 10 attended by children from the same or economically similar families the percentage averages around 10 per cent. Perhaps the most important feature of malnutrition is that it is so common and has so many causes that it requires a searching investigation into the health, the environment, the mode of living, and the diet of a great many children and hence leads to the

correction of many physical defects and habits to which otherwise little or no attention would be paid. The emphasis which has been placed upon the subject has had a far-reaching effect in arousing medical and popular interest in the health of children. It is essential, however, that the physician should have a clear understanding of what the term "malnutrition" actually implies.

In older children the *causes of malnutrition* may be grouped or classified as follows:

1. Physical
   - (*a*) Physical defects
   - (*b*) Infections—chronic and acute
2. Environmental
   - (*a*) Improper diet and faulty food habits
   - (*b*) Bad hygiene
   - (*c*) Lack of home control
   - (*d*) Fatigue
   - (*e*) Psychological

Rarely a single cause will be found; usually two or more factors are contributing and frequently these are so interrelated as to form a vicious circle. Children with malnutrition usually show one or more *physical defects* upon examination, as eye-strain, carious and malplaced teeth, adenoid hypertrophy, diseased tonsils, cardiac disease, kidney disease, constipation, etc. Some of these are mere casual findings while others are more important and have a definite place in the etiology of the condition. Early attention to these will prevent malnutrition just as their removal will aid in bringing about a cure.

Eye-strain is frequent in childhood and is often overlooked. The young child is farsighted, a condition which gradually disappears as he grows older. At about the seventh year nearsightedness begins to develop in some children and unless glasses are worn to correct the visual defect the condition progressively increases. A certain number of children are also astigmatic and this may or may not require correction. It is estimated that about 85 per cent of the preschool age children have normal vision and until school age comparatively few children require correction of visual acuity. At the time of entering school and at the beginning of each subsequent year the eyes should be tested as a

matter of routine. This may be done by the physician. The child should be able to read without difficulty the ⅜-inch letters on a Snellin test chart at 20 feet with each eye, and if this cannot be done the child should be referred to a competent ophthalmologist for further examination and corrective glasses if found necessary. It is estimated that one out of every eight or ten school children requires glasses. Defects in visual acuity cause eye-strain and this in turn leads to headache, nervousness, and fatigue which react definitely upon the health of the child. Further, the child with defective vision is handicapped at sports and hence tends more and more to withdraw from the outdoor exercises and play of childhood which are essential for normal development. Indoor reading and a more sedentary life is substituted and this in time affects posture and general health. A third reaction of defective vision on nutrition has its origin in the difficulty of these children in maintaining their grades in school work. Often a child with unrecognized poor visual acuity is regarded as stupid and a dullard, when in reality he is of normal intelligence but is unable to see the schoolroom blackboard and fails for this reason to grasp the import of his studies. Such children become discouraged and disheartened and develop emotions of inferiority which have a harmful reaction upon the physical well-being of the child as well as upon his psychology. One sees at times the entire picture of a child's nature and health change after the correction of a visual defect.

One of the most frequent and important physical defects related to malnutrition is *obstructed nasal breathing* resulting from hypertrophy of the adenoid tissue of the nasopharynx. The narrow-faced, pinched-nose, half-opened mouth expression of the child with hypertrophy of the adenoids is a frequent clinical picture. The incomplete and faulty ventilation which results is a direct cause of malnutrition. Physical examination of these children reveals a poorly shaped thorax with insufficient chest expansion and low vital capacity. The dryness of the mouth from the continuous breathing leads to restlessness and disturbed sleep and to digestive disturbances and loss of appetite. There is the further danger, also, of repeated acute infections and chronic infection of the paranasal sinuses when nasal breathing is obstructed by excessive adenoid growth, a condition whose frequency and im-

portance as the cause of systemic toxic conditions in children, as chorea, arthritis, and nephritis, is just beginning to be recognized. The relationship between adenoid infection and mechanical blocking and middle-ear disease with its more serious complicating mastoiditis has been recognized for generations. Chronic or subacute infections of the adenoid tissue itself results in the absorption of toxins which impair health and nutrition. Thus excessive adenoid growth both directly and indirectly may lead to malnutrition. The physician should assure himself by many repeated examinations, from infancy on, that the child is not a mouth breather, that the adenoid tissue is not excessive and that the mucous membrane of the nose has the normal tonus and color which is lost when nasal breathing is obstructed. The association of "adenoids" with dullness was one of the first relationships established between physical defects on the one hand and mental growth and school progress on the other. There is one condition sometimes confused with nasal obstruction due to adenoid vegetation. Occasionally a child is seen with obstruction due to a narrow, high palatal arch which presses far into the nasal cavity. Adenectomy will give no relief to the obstructed breathing as a rule, although the author has seen children who have been operated on for adenoids several times in the attempt to relieve the condition. Such a situation is best treated by orthodontic methods. As with hypertrophy of the turbinates in childhood one must wait and temporize until the size of the nasal passages increases with growth. Operation on the nasal bones should be avoided. Adenectomy for the relief of nasal obstruction, or for the removal of infected vegetations, or as an aid in clearing up sinus infections is fortunately a relatively simple procedure and should be done before the obstruction to breathing has had time to influence nutrition. It is frequently necessary in infancy. It is not at all uncommon to have a new growth of vegetation after removal and a second or even third adenectomy may be necessary in a child. It is well to make this clear the first time adenectomy is advised.

A clear and definite distinction should be made between the *tonsils* and adenoid vegetation, both between their effects when pathological and the indication for their removal. The vogue for indiscriminate "tonsillectomy and adenectomy" of recent years is comparable with

the level of "shotgun prescriptions" and "pleuriglandular" therapy. In the experience of the author adenectomy is indicated about three times where tonsillectomy is indicated once. It is only occasionally that tonsils by their size alone cause trouble and indicate removal. Such tonsils are usually a part of a general lymphoid hyperplasia which is looked upon as a constitutional diathesis. When the tonsils are so large as actually to obstruct breathing and the swallowing of food, removal is usually indicated. The tonsil of importance in connection with nutrition and health is the infected tonsil. This is not always easy to demonstrate. Tonsils the subject of repeated attacks of acute infection are sooner or later apt to be the seat of chronic infection in addition and hence their removal leads to nutritional improvement. The low-grade chronic infected tonsil is more important. The best indication of this is the persistent enlargement of the anterior group of cervical lymph-nodes, particularly if the lymph-nodes show fluctuation in size without attacks of acute tonsillitis in addition to the persistent enlargement. The mucous membrane about such tonsils often shows a mild, subchronic, inflammatory reaction and purulent material can be expressed from the tonsillar crypts by pressure or suction even when the tonsil itself shows no signs of inflammation. Small buried tonsils are more apt to be harmful than larger-sized tonsils protruding into the throat. While the importance of mechanical blocking by adenoids is obvious, the relation of the tonsil to malnutrition or other disorders in the individual child is often uncertain. Tonsillectomy should be much more cautiously advised than adenectomy. The reasons for removal have been indicated in the discussion. It is rarely indicated before the fourth or fifth year. The operation is more severe and at times a cause of fatalities. Tonsillectomy is too frequently advised, particularly by nose and throat specialists, and is too frequently done as an irrational combination with an indicated adenectomy. We sometimes see tonsillectomy followed by a compensating hypertrophy of the lymphatic tissue remaining in the pharynx, and a resulting type of more or less chronic form of pharyngitis and tracheitis and a tendency for colds to become bronchial which is decidedly annoying and prejudicial to health. When the tonsils are the chief cause of the malnutrition one sees immediate and splendid results

following their removal, but too often the results are negligible. While one can say with certainty that obstructed nasal breathing due to adenoids will sooner or later impair health and lead to malnutrition, and hence their removal is indicated as a preventive measure, there are no such direct criteria available for the tonsils. Children with frequent attacks of tonsillitis after 4 years of age are better off perhaps if the tonsils are removed in order to avoid the danger of systemic toxic diseases as well as to maintain normal nutrition. Children with chronic infection should be closely watched in order that the earliest signs of malnutrition may be noted and the tonsils removed at this time.

The relation of *carious teeth* to malnutrition is mixed. While a large percentage of malnourished children have carious teeth, a similar percentage is frequently found in children with a good nutritional condition. Malnutrition, particularly in early life, is most certainly a cause of dental caries, and some even consider the nutrition and diet of the mother during pregnancy as an important factor in this connection. That carious teeth in a child should receive regular and frequent attention is beyond question. The care of the teeth has been discussed in Chapter V. A subject of importance is the matter of *malocclusion* or poor approximation of the teeth of the upper and lower jaws. Irregular teeth or teeth out of line which do not permit of proper closure or approximation interfere with the mastication of food and hence lead to poor habits of eating and in turn to digestive and nutritional disturbances. The "6-year-old molars," the first of the permanent teeth, are most important and are regarded as the "key" to the dental arch; hence they should be most carefully looked after and preserved. Orthodontic treatment for bringing the teeth into proper alignment is frequently followed by a general improvement in nutrition; it also has an important esthetic and hence psychological value. If children are taken to a dentist early and proper care given to the teeth, it is often possible to prevent the development of dental caries and to develop good alignment and approximation.

Cardiac disease is a frequent cause of malnutrition. It was discussed in the preceding chapter and we mention it merely for the purpose of illustrating the relationship which exists between the two. The

condition and progress of the child with cardiac disease is perhaps best judged by the condition of the child's nutrition.

Constipation with the absorption of intestinal toxins is not infrequently associated with malnutrition. The prevention of constipation lies in the use of a proper diet and in the early formation of regular daily habits of emptying the bowels, which have been discussed in previous chapters.

Along with this discussion of physical defects causing malnutrition we must include a brief discussion of a certain type of inherited constitution, if one may look upon it as a defect for purposes of discussion. There is a certain type of asthenic child, tall, narrow-chested, thin, and frequently with a long or redundant large intestine as shown by radiographs, who is prone to be more or less in what might be termed a natural state of malnutrition. Usually the muscular tonus is poor and with rapid growth, postural defects are the rule. In these asthenic children the poor physical condition is inherited and not acquired and hence cannot be prevented in the usual sense. And yet if this type of child is recognized early, as it should be by a glance at the physique of the parents, a great deal can be done to prevent the development of severe malnutrition. Diet, exercises for muscular development and posture, relaxation periods, etc., should be started early so as to overcome the effects of the inherited tendencies. One must use judgment in classifying these children as malnourished in the usual sense, for quite as a rule these children are under average weight for height and the malnutrition in so far as underweight for height is concerned is more or less natural for the type of body habitus. Inherited tendencies to types of body habitus must always be kept in mind when examining children for physical defects in relation to malnutrition.

As will be noted from the discussion there is a close relationship between physical defects and the question of infections. Acute infections, as the more severe exanthemata and pneumonia for example, may be the starting point of a period of malnutrition and poor health. The effect upon the general nutrition is dependent upon the severity of the infection, the type of complications, and the care and hygiene during

convalescence. Too frequently there is a tendency to rush the child back to school and into the usual régime.

More important, however, is the association between malnutrition and chronic infections. Malnutrition is such an integral part of the picture of chronic infection that it must always be considered in working out the etiology in an individual case. (The necessity for this is one of the reasons why the nonmedical health workers are incapable of handling the malnutrition question.) There is also a reciprocal relation in the maintenance of good nutrition in children with chronic infection which tends to prevent the progress of the disease. We have mentioned heart disease which results from infection among the physical defects because once acquired it acts more or less in a mechanical manner similar to the congenital cardiac disease of infancy. Kidney disease, either nephritis or more commonly pyelitis, is sometimes found on the urinary examination of a malnourished child. This is practically always secondary to an acute infection. Low-grade chronic pulmonary infections are a frequent cause of malnutrition. They may involve the parenchyma, bronchial tubes, or more frequently the tracheobronchial lymph-nodes. Their prevention is largely a matter of hygiene. Rest and exposure to sunlight, with a change of climate at times, is necessary to prevent children with such tendencies from developing chronic malnutrition. In the chronic tuberculosis of older childhood, in syphilis, and in malaria, malnutrition is an integral part of the clinical picture. In all the acute and chronic infections malnutrition is a result, although poor nutrition with the accompanying low resistance *per se* is a predisposing factor to infection. We can generalize the prevention of malnutrition resulting from infections by saying that it lies in the prevention, correct treatment and suitable after-care of the specific infection.

Environmental Causes.—Errors in diet and improper food habits play an important part in the development and malnutrition in older children as well as in infancy. It is rare in the United States to run across a child who has insufficient food as a result of poverty. What is common is to find the child who will not eat the food provided, or that the diet is one-sided and not general enough, or that some one necessary food element is lacking. Closely associated with this

are improper habits of eating and the two are so interrelated that they may be considered together. In addition to bad habits, such as the bolting and insufficient chewing of foods, eating at irregular hours and between meals with subsequent lack of appetite at meals, habits of a psychological nature play an important rôle. Thus young children frequently find that their diet is a matter of anxiety to the mother and learn that they can coax privileges or be bribed to eat. Soon this becomes a matter of the child's finding that by being perverse in regard to eating he becomes the center of the picture and this appeals to his love of attention and admiration. The story that the child will not eat a thing without hours of coaxing by the nurse or mother is all too common, and it is difficult to persuade the mother to leave the child alone and never to mention or discuss food and to ignore the fact that the child does not eat. Other children by being "willful" learn that they can get exactly what they want, and soon the mother gives in and allows an abnormal or improper one-sided diet to the ultimate harm of the child's nutrition. The prevention of improper food habits is of tremendous importance and consists in the early training in proper habits. These have been discussed in Chapter V and we need not go into detail again. Likewise the use of the proper and correct diet as outlined in Chapter IV is the only method of preventing the child from obtaining an improperly balanced ration. We wish only to stress at this point the paramount importance of food and food habits in the prevention of malnutrition.

By bad hygiene we mean faults in the hygiene of the home, *i.e.*, poor housing, lack of space, overcrowding, poor sanitary arrangements, etc., as well as personal hygiene in the care of the teeth, use of water, bathing, rest, sleep, exercise, clothing, and the like. Here again the child, to a large extent, reflects social and economic conditions and in these matters the education of parents is essential in the training of the child. Health education in the schools can never replace home training.

Lack of home control and fatigue are two of the most important etiological factors associated with malnutrition. As we have said and implied before there is nearly always a composite group of factors responsible for malnutrition and the exact part played by each is

difficult to apportion. Home conditions which permit of improper diet and food habits are also likely to lead to lack of proper parental control of the child. This usually is not a fault of the child but of the parents. On one side we may find overindulgent parents who spoil the child and permit it to do as it wishes, pampering every whim or fancy, like or dislike, regardless of the effect upon the child's health; and on the other extreme, parents who fail to realize that in early life the child has a world of its own from which it must gradually grow and adjust itself into the world of the adult, and who try by discipline and repression to force their own world too early and too rapidly upon the young child. Each is a fault. "Nervous children" are not born nervous: they acquire nervousness from the environment. Children living in a household of nervous activity, jumping rapidly from one thing to another, living under a constant tension, soon mirror the nervousness of their elders. The child who goes to school, exercises, takes outside lessons and then goes to movies, parties, and obtains insufficient rest and sleep, soon becomes fatigued. Fatigue in turn prevents proper rest and sleep and a vicious circle is on the way. This overactivity itself is often a sign of fatigue and manifests itself by irritability, instability, failure to gain weight, and eventually malnutrition. The "American disease" of overactivity plays an important rôle in the malnutrition of childhood. Fatigue from these causes is more frequently found among the well-to-do "society" classes where everything, even the health of the children, is sometimes sacrificed to keeping up with the crowd. As a matter of fact these things are sometimes forced upon children with the best of intentions by parents who have no comprehension of the play life of the child and interpret play and amusement in terms of their own adult experiences and reactions.

Last of all we have to consider certain psychological reactions. The child has certain fundamental or primary instincts or emotions, as fear, love, anger, jealousy, and the like, which in the normal child are adjusted and brought into control and which form a normal part of its life and development. At times there is a failure of adjustment of these emotions to the environment and failure leads to emotional conflict. Thus jealousy of a sister or brother, or fear of some person

or thing, or a feeling of inferiority to other members of the school or play group will lead to brooding and worry, abnormal introspective tendencies, and unhappiness, which in turn have a harmful effect upon the health of the child and which may lead to malnutrition. Such conflicts are much more common than is generally recognized and their recognition and prevention is important for the nutrition of the child as well as on account of their effect upon normal mental growth and development.

We have attempted to give a brief summary of malnutrition in the sense the term has come into common usage in pediatrics. In that it is itself, or leads to, abnormal growth and development, it is of importance in preventive pediatrics. Perhaps one can say that in the earliest form it is recognized by the failure of the child to gain weight at the rate of average gain over a period of time at a certain age period. This can only be determined by continuous records of growth and repeated physical examinations. When the child fails to gain over a period of months the question of the factors involved must be carefully studied and corrected before actual malnutrition has developed. In order to educate parents in the care of children and to supervise growth and nutrition, a knowledge of the etiological factors of malnutrition is necessary in order that the condition may be avoided. Not only must the physician recognize the physical causes of malnutrition, but he must recognize the importance of environmental factors.

SECTION III

METHODS

CHAPTER X

THE CHILD HYGIENE MOVEMENT

HISTORICAL CONSIDERATIONS

We have drawn a distinction between preventive pediatrics and child hygiene in the introductory chapter. In preventive pediatrics, as we use the term, we are interested in the knowledge of the normal growth and development of the child and in methods of preventing disease and deviations from normal development. The term child hygiene in its common usage refers more to "public health" methods of education and to the development of group methods for the practical application of this knowledge. We emphasize this distinction as we are coming more and more to see the weakness of some of the public health methods, and that as far at least as the individual child is concerned, preventive pediatrics is on a sounder and broader basis when applied in private practice. We can only briefly discuss child hygiene, as a complete discussion would equal the size of the entire volume.

The child hygiene movement as a phase of public health is of decidedly recent origin. It would in all probability still be struggling had it not been for the World War which brought out and drove home to the public as never before the amazing extent of physical deficiency among young men. It is of such recent origin that new methods are constantly being tried out and older methods discarded. It is still in the stage of experimental development as regards values and methods and the scope of the work is being constantly revisualized. This needs particular emphasis, for the field of child health has attracted and developed many nonmedical health workers, and many experimental methods and phases have been accepted by them as of fixed and permanent value. The physician, upon whom the knowledge and development of child hygiene fundamentally depends, as all the knowledge of nurses, nutrition workers and the like is purely secondary and derived

from medical knowledge, should keep this broad aspect clearly in the background of his mind and should maintain a scientific attitude toward the work. In fact, it has been the rush of nonmedical workers into the field and their assumption of direction without a requisite background of medicine that has sometimes resulted in the child hygiene movement getting off on the wrong foot—a fact which has led many physicians to decry the work and to have unfortunately confused preventive pediatrics and public health methods as one and the same thing. That preventive pediatrics owes much in its development to child hygiene is unquestionably true, but that everything in regard to child hygiene has been developed on a medical background through the work, study, and investigation of physicians is likewise true. There is no conflict between the physician and the child hygiene movement so far as aim and objects are concerned. The question of methods, however, has been disputed at times, rightly and wrongly. When conflicts of opinion have occurred it has usually been the result of overenthusiasm on the part of the nonmedical child hygienist and lack of interest on the part of the physician, together with a decided lack of knowledge and vision on the part of both.

We can perhaps come to a better understanding of the child health movement by giving a brief résumé of its development. Historically, so far as the United States is concerned, the first development of what is now a part of child hygiene took place when physicians were added to the schools in an effort to prevent the spread and development of the contagious diseases. The present scope of school hygiene will be discussed later. In the first years of the twentieth century, when general interest in public health was being aroused by the medical profession, the high rate of mortality in infancy, particularly during the summer months, was an obvious point of interest and attack. Summer clinics for the care of sick infants were organized by municipal and private agencies and this might be looked upon as the start of the "Infant Welfare Movement." It was in 1907 that the American Association for the Study and Prevention of Infant Mortality was organized. Experience over a few summers brought out two distinct facts of importance: (1) It was found that there was little value in trying to lower the infant mortality rate by the treatment of sick infants, but

that attention and care must be given the infant the year around in order to prevent the summer diseases. (2) The necessity of home care and instruction was indicated, and this need led to the utilization of nurses in home educational visiting. The summer clinics thus gradually extended to the year-around clinics with visiting nurses. One of the interesting phases of development at this early period centered around the question of milk. Pediatrics at this time was interested in the question of artificial feeding and was passing through an era of percentage feedings which, as we now see in retrospect, put back the subject of infant feeding many years. The emphasis of pediatric teaching was placed on the technic of artificial formulæ. So "pure milk" became the *sine qua non*. In some communities milk stations were opened and "prepared formulæ" were given out and only as an afterthought or secondary need were doctors and nurses added. This was the last word, so to speak, in infant welfare. Its value was of great importance in so far as it awakened community interest in pure milk and the milk supply—most of our laws date from the interest developed in the subject at this time—but curiously enough it was in a way detrimental to the interest of infant welfare as it emphasized artificial feeding rather than maternal nursing. As this was recognized, the milk functions were gradually detached from the clinics. As the work progressed and developed, a slow but steady realization was reached that the chief purpose of infant welfare work was educational in nature—not relief or treatment—and so a steady transition of the clinics into centers for the education of mothers and the supervision of well babies took place, with the result that to-day our infant welfare centers are quite generally known as health centers or well-baby conferences, names which more aptly describe the type of work being carried on.

During this time general educational methods relating to the care of infants were being developed and experimented with. Analysis showed that the reduction of the infant mortality rate which was taking place during these years was largely a matter of cutting down the summer peak of infant mortality. Detailed study led to the appreciation of the fact that after the infant mortality had been lowered to an approximate point of 70 or 80, one-half of these deaths took place

in the early weeks of life and before the time the children came under the care of the well-baby conference as a rule. This, together with the high maternal death-rate in the United States, led to the development of the prenatal clinic for the supervision of women during pregnancy, and to the inclusion of the prenatal period of development in the field of child hygiene. At the same time medical work in the schools was developing. It was found that a large percentage of children entering school were unable for physical reasons to maintain their grades. This led to interest in the preschool child, the age period of 2 to 6 years, and this developed a new group of problems to be solved. At the same time interest in the health of institutional and dependent children, in the mentally deficient and the psychopathic was aroused, and so gradually the scope of child hygiene grew to include all periods from conception through puberty. This was exemplified by the change in name of the Infant Mortality Association to the American Child Hygiene Association in 1919, and its amalgamation with the Child Health Organization which had been developing the field of health education, into the present American Child Health Association in 1923. Other national health associations as the Tuberculosis and Social Hygiene Societies have found that the child is the basis of health work and have in one phase or another extended their work into this field; and the logical outcome will be the amalgamation of their activities, an event foreshadowed by the formation of a Child Health Council in 1919, in which all will participate in the working out and correlation of problems of child health. Synchronous with the development of activities there has been a recognition of the health of the child as a matter of national importance and welfare. A Federal Children's Bureau was established in 1912 and at the present time almost every state has organized a department of child hygiene in connection with its public health activities and many of our municipalities have been pioneers in such work. The type and scope of this work differ largely as regards local methods and conditions.

In all of this work the guiding motive has come to be recognized as one of education rather than medical relief. We must look upon the child health movement almost wholly as an educational movement and the answer as to the value of the individual method or means used must

depend, in the final analysis, upon whether or not it has educational value. Similarly the question as to relative values between methods is one of relative educational value. It is the purpose of the movement to educate the parents in the methods or means necessary for bringing about normal growth and development of the child and the education of the child in correct habits of hygiene and living. This implies the necessity for regular, continuous supervision by a trained observer—the physician. This in turn means the training of physicians in preventive pediatrics and in this we reach the gist of the subject from a medical standpoint. Welfare clinics, aside from their educational value, are only a method or means of providing supervision for parents who, for economic reasons, are otherwise unable to obtain such supervision, or to serve in the present stage of the development of medicine and preventive pediatrics, until physicians as a whole have acquired such training in their medical schools and are prepared to give such supervision. That this is best considered the function of the family physician is discussed in the following chapter. Leaving aside the broad import of the relation of child health and welfare to national welfare one cannot but admit that where the health of the child touches the life of the community, as in the schools, or that where the community assumes the care of the child, there is a definite health function and responsibility on the part of the community. Beyond this, however, the problem is one largely of the individual family and home. That the child hygiene program has been effectual is shown by the reduction in infant mortality in the United States from 149 in 1900 to 77 in 1923 (Registration Area Figures). This is only a small part of the field and it is difficult to judge of the effect of the movement upon the health of children or their growth and development; nor is it possible to evaluate the part played by different methods or means used—a most desirable and needed check upon the direction of future efforts.

The term "propaganda" is at present in such general disrepute that one dislikes to make use of it, yet a large part of the efforts of child hygiene work has been along this line. In order to arouse community and individual interest on the part of parents there has been an extensive propaganda emphasizing the importance of child hygiene, both in relation to the child and in regard to its importance to the com-

munity and social welfare of the nation. Thousands of addresses of one kind or another have been given by physicians and health workers and an active campaign has been carried on in the press. That the propaganda has been successful is shown by the rapid growth of the child hygiene movement. Our chief reason for mentioning propaganda is that it has had more effect with the community at large than it has had upon the medical profession as a whole, and in a sense more has been promised by implication than is capable of fulfillment. There is no question but that the community is demanding something from the medical profession that physicians *as a whole* have not been prepared to give. Even to-day it is not infrequent to find physicians who have no interest in the health of children except when they are ill. Is it at all illogical that parents should turn to "public health centers" for advice and for the supervision of their children when they have tried the family physician and he has been found uninterested in and without a knowledge of preventive pediatrics?

But propaganda to arouse interest in child hygiene is not practical education of parents in the care of the infant and child. Attempts at general education have been carried on by health lectures, by articles in the newspress, weekly and monthly journals, and by the distribution of many hundreds of thousands of instructive circulars and pamphlets of one kind or another. How much real educational value of practical application to the individual child there has been in this is decidedly questionable. Necessarily such discussion of health subjects in print must be handled in a general way and what is needed for the individual baby or child is more or less specific. Hence the constantly reiterated advice of recent years for "repeated medical examinations and supervision." In many respects health literature, even if educational in type, is largely of propaganda value. Baby shows, health contests, weighing and measuring festivals are only mentioned to be condemned. It is of no value to examine children superficially, or even to examine them carefully in large groups unless a definite program is ready to lead to the correction of the defects found and there is an opportunity to give competent advice in regard to the problems of each individual child. Moreover, the interest in child hygiene has led to the use of such methods for cheap advertising schemes because of the psychological

value, and parents have been led to believe that by having the child weighed and measured they are doing something.

Perhaps the most effective method of direct education used in child hygiene is through the home visiting of public health nurses to instruct mothers in the hygiene and home care of their children. This is particularly true of the care during the period of infancy. The home visiting instruction in the care of older children is of uncertain value, as it is difficult to determine its efficiency. With the higher educational standards for nursing and specific instruction in public health nursing the efficiency is increasing, but to anyone who has been in contact with public health nurses over a period of time it is quite obvious that a large part of our instructive nurses are educationally and constitutionally incapable of teaching. Their work consists largely of the routine filling up of records, keeping statistics, and the like, and their educational and teaching value is questionable.

Another phase of general education of more recent development is the health education movement for children, utilizing the teachers and schools as the method of approach. This is still in its infancy and the question of methods and values is far from being settled. It attempts to interest children in their own health in various ways, and to teach and fix proper habits of living. Theoretically it has tremendous possibilities but already in its early days the movement has been maltreated by overenthusiastic and well-meaning but ignorant health workers, and many of the health crusades and the like that have been carried out under the guise of health education have been largely buncombe and of no actual value. Attempts are being made to put it on a sound basis capable of permanent results. Even if it does nothing more than arouse the interest of the teacher in her own health as well as in the health of the children under her care, it has a decided value. In fact, in health education the teacher is the crux of the situation and it is her education which is essential at the present time if the movement can have any real effect upon the children.

In addition to the general educational side of child hygiene, a large part of its work has been the development of methods for the purpose of giving specific information in regard to the care, health, and development of the individual infant and child. As a matter of fact this

specificity has probably been the most effective method of education in addition. From the first the need of trained and interested physicians for the work has been recognized as of fundamental importance, as it is work which no one other than the physician is capable of doing. As public health methods must reach large numbers of children the development has been chiefly by utilizing the group or clinic method. Both because of practical needs and because the nature of the problems varies at different age periods, certain age period groups have been developed, as indicated in the discussion of the development of the child health movement.

PRENATAL CLINICS

The prenatal life of the child is provided for through the prenatal clinic which attempts to provide for the expectant mother the medical care and supervision a pregnant woman should receive from early pregnancy to delivery. From time to time urine examinations, blood pressure determinations, and pelvic examinations are made and recorded. Advice is given as to diet and personal hygiene. In certain groups Wassermann reactions are made and treatment given if indicated.

When it is apparent that complications may develop, arrangements are made for hospitalization. The number of mothers who can be supervised in such a clinic is, of course, limited. At the present time there are not a great number of prenatal clinics in existence. Prenatal clinics do not attend to the confinement but arrange for it through private physicians, midwives, or maternity hospital services, as the needs and desires of the patient may be. While the result upon the maternal mortality has been little, it has demonstrated that such supervision has a decided effect upon limiting the number of abortions and stillbirths and it is the only method of reaching and reducing the high infant mortality rate of the newborn infant and during the first few weeks of life. That the method is of value is shown by the results obtained. Two districts of a similar character were selected in Boston. In one of these prenatal care was given through the District Nursing Association. In the district without prenatal care the infant death-rate was 32 in 1,800 cases, and in the prenatal care district 14.1 in 2,100

cases. Stillbirths were reduced from 34.9 to 22.7. Similar results have been obtained in New York, St. Louis, and other cities.

The problems of the prenatal clinic are essentially medical ones and the attention and supervision is only that which should be given to every expectant mother. As no particular skill or experience beyond that which is in the possession of the practitioner is required, the clinic work should be limited to the class of patients who are accustomed to use charity hospitals or midwives for confinement. Abnormal cases should be selected and referred to hospitals or practitioners making a specialty of maternity work. The need of supervision during pregnancy is an essential of preventive medicine as related to both obstetrics and pediatrics and is as much a part of the physician's work as the delivery itself. Only a small percentage of births are difficult or complicated and the chief need is the separation of these cases from the usual run of maternity cases before it is too late.

INFANT WELFARE

We have traced the origin and development of the infant hygiene work. Its essential purpose is to provide direct and continuous medical supervision of the growth and development of the infant. For this reason the baby should be enrolled as early in infancy as possible, being referred direct from the maternity hospital services. The baby leaving the hospital some 10 or 15 days after delivery is at once visited by the nurse in the home and at about 3 weeks is brought to the clinic for weighing and consultation. This is the period when troubles usually begin and as the first 3 months of life are so important, frequent visits are necessary at this time to avoid the development of nutritional disturbances. After the third month a visit once a month is usually sufficient for the normal baby until the end of the first year, and thereafter every 2 or 3 months. The general educational work and propaganda have created such a demand for infant supervision that the well-baby conferences are apt to be overrun and too large. In a 2-hour period not more than 40 or 50 babies can be seen and then only if the physician is experienced and the number of new cases small. Measuring, recording, and weighing is done by the nurses and clerks and instruction in details

of formulæ given by the visiting nurses who are in attendance. If the clinic attempts more the work becomes superficial and perfunctory. Experience has shown that sick babies, especially those with febrile disturbances, cannot be attended to at the same conference and must be referred to a private physician or a hospital organization. The stress must always be on health and normal growth. Mothers must be instructed not to bring sick or febrile infants to the conference, as otherwise the clinic serves as a breeding ground for the transmission of infections. This refers particularly to colds as well as such infectious conditions as measles and the like. In addition to the supervision of feeding and nutrition it is the function of the conference to vaccinate against smallpox and to give toxin-antitoxin during the latter half of the first year of infancy. The centers should be located in the poorer and congested districts and easily accessible to the economic classes for which they are primarily intended. It is true that at the present time well-baby conferences are attended by some who can afford to pay a private physician—exceptionally, however, by those who can pay a specialist's fee. Many clinics have tried to work out an economic standard, an income above which excludes the applicant from admission. This is fraught with practical difficulties and must vary in different communities and in different conditions. Investigation of incomes has been tried and found impractical. One of the chief difficulties in limiting cases on an economic basis lies in the fact that many practicing physicians are neither trained nor interested in preventive pediatrics. Their viewpoint of medicine is one of the care of disease rather than the maintenance of health. It is only exceptionally that this has an economic basis, and as a rule is chiefly the result of the type of training in pediatrics in our medical schools of ten or more years ago. The author can state from personal investigation that a large percentage of the older babies finding their way into a health center and on an artificial feeding have been taken off the breast by the direction of a private physician. All too frequently they have been put on some proprietary food with instructions to "follow the directions on the can," and this is the start of a situation which eventually sends them to the clinic for help. There is a moral and social side as well as an economic and professional one involved in these cases when the question arises as to

the suitability of their admission to the clinic. When the time comes that the majority of physicians in practice have been trained in preventive pediatrics, and in infant feeding as practiced to-day, in contrast to the impractical methods taught ten to twenty years ago, this class will disappear and the clinic will serve only those groups whose economic status does not allow of medical supervision for their children. This change is expected chiefly because the conference method of supervision is not the best method, as will be discussed later. To this group, however, the community has not only a duty and responsibility, but the welfare of the nation as a whole demands that children shall grow and develop into healthy, normal adults.

PRESCHOOL CHILDREN

Children from 2 to 6 years of age present a new set of problems which differ widely from those of the infant group. Growth is no longer so rapid nor does the question of diet require the detailed supervision of infancy. Nevertheless it is a period when many children develop malnutrition and physical defects as is shown by the examination of the 6-year-old child on entering school. It is essentially a period of habit formation although many habits have their origin during infancy. As we understand them at present the chief health problems center about the subjects of nutrition, habit, and posture and all three are closely interrelated. These subjects have been discussed in previous chapters. The question as to how the preschool age is to be handled as a public health problem has not been solved. It is fairly easy to interest mothers in the care of the infant, and at school age all children are registered and concentrated under public authority, hence it is not so difficult to do satisfactory work at these periods. With the "runabout" child it is different. The mother loses interest when frequent clinic attendance is not urged, or perhaps another baby requiring most of her attention comes along, or for some other reason little attention is paid to the health of the runabout unless it is ill. The distinctive preschool conference has not been much of a success and its methods and scope are still in an experimental stage. Although the type and character of the problems and medical examination are more involved and require

more time, the preschool work will in all probability have to be closely combined in some way with the infant welfare work, as it has been found of extreme practical difficulty for the mother to find time or opportunity to attend multiple conferences. As in social work the family will have to be considered as a unit in solving the health problems. There has been a tendency to develop certain phases of preschool child hygiene into entities, such as habit clinics and nutrition classes which have been organized separately. Unless these are closely related and both are organized with a general physical or medical background their work is bound to be one-sided and incomplete.

SCHOOL HYGIENE

In many respects health work with the school child has been more fully developed than health work of any other age period. Started primarily to control "contagious" disease, its scope has extended far beyond this field and at the present time includes in one way or another nearly every type of child hygiene activity. There are two rather distinct viewpoints in regard to the nature and scope of child hygiene in the schools. On the one hand, it is held that outside of school sanitation (including in this the control of communicable disease) the health and hygiene and physical development of the child are not matters of school function or interest. This latter is regarded purely as a personal, private matter and the school is simply engaged in "educating" the material as it comes. To this restricted viewpoint some would add simply the field of "health education," as it involves pedagogical principles and work. On the other hand, there is a much broader viewpoint which considers the school as a preparation for life and recognizes the importance of health. It further recognizes the interrelation between health and the progress of the child in school. It takes the viewpoint that physical growth is of equal importance to the individual and the state as mental growth; and as the state has assumed authority and responsibility for the one, it has an equal responsibility for the other. If parents will not educate their children at their own expense the state steps in and does it at the expense of the state. This same social attitude is regarded as of equal importance

in the field of physical development and the schools are logically regarded as the means of carrying out such a function on the part of the state.

In general our school system has developed child hygiene to a point midway between these views. Thus the physical examination of school children has been introduced into many schools. The scope of the examination varies widely from simple weighing and height measurement to a thorough and complete examination. By these examinations it has been found that a large percentage of the children in our public schools have physical defects that are remediable. Professor T. S. Wood a number of years ago estimated that there were in our public schools between 300,000 and 400,000 children with heart disease, 1,000,000 with deafness, 5,000,000 with visual defects, 6,000,000 with diseased tonsils and adenoids, and 5,000,000 with malnutrition. We further know that some 25 per cent of the children have to repeat a grade at some time during their early school life. Physical defects and ill health and mental retardation are responsible for a large part of this repetition. The economic cost and waste of this vast number of children repeating grades each year is enormous, to say nothing of the effort expended upon them by the teachers in order to keep them up at the expense of those physically and mentally able to go ahead. The yearly cost of this is about equal to the combined income of all physicians in the United States. Most schools confine themselves to finding physical defects and notifying the parents with the request that they be corrected for the good of the child. Some schools, however, go further and provide extra lunches for the underweight, special schools for the children with cardiac disease, special schools for the cripples and for mentally retarded children, and outdoor schools for special types or classes of children. In some schools dental clinics have been established and others have gone further and provided dental hygienists. In some this is supported from school (tax) funds, and in others by funds obtained from outside sources. If this is a school necessity and function, and the same holds for prenatal and infant welfare work, the expense of public health work in child hygiene should be community expense. There is, however, no unanimity of opinon as to this point nor as to the extent to which child hygiene should be maintained

at public expense. Naturally conditions and needs vary in different communities and the problems from a public health angle differ in rural and urban communities and in urban communities of different sizes, although the individual health conditions and problems are the same.

There is one phase of school activity that is essential. This is the relation of play and exercise to the health and education (mental development) of the growing child. With the change in American life from a rural to an urban character, facilities must be furnished by our communities for play and recreation. Play is recognized as of primary importance in mental growth and development. Group play is of decided educational value. As a child approaches adolescence he becomes interested for the first time in physical development and interest in organized sports and athletics becomes a natural instinct. We have mentioned before the importance of organized athletic and outdoor activities in controlling the "gang instinct" and as a substitute for the developing sex instinct, and in this way developing a normal social sense so important in controlling bad tendencies in youth. Athletics and organized play are decidedly factors of educational importance. It should be the function of our schools to provide space for and supervision (instruction) in organized games and sports *for every child*. The entire subject is one of the conception of the school function. While there may be an honest disagreement as to the extent of purely medical child hygiene activities in the schools, there can be no question as to play facilities. In the same way that education has progressed in purely pedagogical matters and has been turned away from a narrow conception of the curriculum to encompass the needs of the individual child, so there is sound basis for the argument that in a compulsory school system which takes the time and dominates the life of the individual from 6 to 14 years, the school function is not only concerned with mental development but must consider the health and physical development of the child and devise and utilize methods by which this may be attained.

Concerning the use of physicians and nurses in the schools, details of work, organization, record forms, etc., the reader is referred to one of the books on child hygiene or one limited to this subject alone.

There are numerous other phases of child hygiene which do not come

under the scope of our subject, as the care of institutional children, dependent children, etc. They are subjects in which the physician dealing with children should be familiar and interested. In every project of child welfare there is a distinct physical or medical side or background. In concluding this chapter on child hygiene it may be said that where there have been competent medical interest and direction on the part of the physicians in a community, child hygiene activities have fitted in with the practice of our profession; where these have been lacking difficulties have frequently developed.

CHAPTER XI

PREVENTIVE PEDIATRICS IN PRACTICE

AGE AND HEALTH FACTOR

From the first we have drawn a distinction between preventive pediatrics and child hygiene, and have indicated and implied several times that child hygiene was not the ideal or best method for the application of the principles of preventive pediatrics. The better method is the application of these principles in private practice. We came to this conclusion several years ago after experience in both methods and to-day are more than ever convinced of the correctness of this view. There are several reasons of fundamental importance for this viewpoint which not only involve theory but practice.

The life and development of the child is a continuous process. For child hygiene purposes, as was pointed out, it has been necessary to consider the life and development as made up of rather distinct periods. These periods are in reality not sharply defined but one merges gradually into another, and there is a close interrelationship and dependency between the different periods. The health of the preschool child depends in large part upon the health during the period of infancy and the physical condition of the school child upon the preschool period. Habits formed in infancy influence the course of the succeeding years, and habits of the 2- to 6-year age period are important factors in the development of the school child. On first thought one may regard the supervision of the child under child hygiene methods as continuous, in that, theoretically at least, it follows him from the prenatal period through his school years. In reality, however, this supervision is not continuous in that the child is being supervised by a constantly changing group of physicians. Not only with each age period does he pass into the hands of a new group of supervisors unfamiliar with the individual development problems of the previous period or periods, but in each age period there is a constant turnover of the health center per-

sonnel, both of physicians and visiting nurses. The result is that the vast majority of the children enrolled are largely numbers and record forms. Continuity of supervision is essential and this is unquestionably better when there is continuity in the supervisor.

Child hygiene supervision from a public health standpoint is restricted almost entirely to the care of the well child and to the physical examination of children and the pointing out of defects. This means that the child when well is under the care of one physician and when sick under the charge of another. This is most illogical. Health and ill health in the individual are but different states or conditions in the same organism. In order to judge of the degree and character and abnormality in a given individual, a knowledge of his normal condition is a matter of great importance. Conversely, certain children have tendencies to certain types of disease as pulmonary, gastro-intestinal, nervous, etc., and a large part of the function of preventive pediatrics in relation to the individual child is the prevention of these diseases and the correction of these tendencies. If the responsibility is divided both physicians are decidedly handicapped and it is unfair as well as detrimental to the interests of the child.

Child hygiene measures can never reach the great mass of children, particularly in the early years, in so far as direct technical supervision is concerned. Supervision through health centers is capable of reaching only a limited percentage of the child population and is not practical except in certain localities in urban communities. Supervision by a physician has been the constant aim of child hygiene propaganda, but public health measures have provided but for a comparatively few.

That a detailed knowledge of the environment is essential for the successful practice of preventive pediatrics has been pointed out, and it is obvious to anyone who has dealt with the health and development of children. Environmental factors as the type of home, the temperament and character of the parents, habits, and the like are extremely important and have a tremendous influence upon the development of the child. Frequently the only clew to the etiology of abnormal conditions will be found in a careful first-hand study of the child's environment. Preventive pediatrics can never be practiced at the office desk alone. The first or early contact should be made in the home so that the physi-

cian can judge of the type and character of the supervision of the child. In child hygiene work this is at best a second-hand picture obtained from a visiting nurse or social worker, and her description of the home as to number of rooms, cleanliness and the type of care and interest of the mother in her children gives at best a vague picture of the environment.

The gathering together of large numbers of infants and young children is sooner or later bound to lead to unnecessary exposure to communicable diseases, despite every possible practical precaution. The mingling of large numbers of young children is directly contrary to the principles of preventive pediatrics.

Lastly, there is lacking the touch of personal interest and responsibility in the clinic or conference. Here the human equation comes into play as always with human relationships. The friendship and relation which exist between the parents and children and the physician in private practice can never be developed in the clinic or conference. This together with the sense of personal responsibility on the part of the physician which calls forth his best efforts is a matter of unquestionable importance. In the clinic as a whole these are lacking and the practice of pediatrics becomes more or less of an organized medical treadmill with the result that an intangible something which sets the physician apart in the values of human relationship is lost. At its best the practice of medicine is the bringing of a knowledge of modern scientific methods for the prevention and treatment of disease into cooperation with the human relationship of the physician as guide, counselor, and friend of the individual—the application of modern medical science by the family physician.

In addition to these purely technical reasons there is an important psychological factor. The value placed upon anything by an individual is closely related to its cost, whether the cost be reckoned in terms of money or in terms of effort. The cost in effort to attend a conference by a woman with children who does all her own work is sometimes far greater than the value of a fee paid by the more well-to-do class. But advice that is free is often easily disregarded and considered of little value, and, as a consequence, the amount of effort that is wasted in the clinic is obviously greater than that in private practice.

It is a consideration of these facts which leads us to the view that private practice is a much better place for the practice of preventive pediatrics than public health methods of child hygiene. It is not that the child hygiene methods of supervision are of no value or that they should be discarded. They are seemingly the only practical method which will enable us to provide medical supervision and education in the care of children to classes or groups of the lower economic levels of society, and as a matter of fact health centers to-day cater largely to this type of children. But many enthusiastic child health workers have expressed the view that as the child hygiene conferences are of such tremendous importance and value they should be extended to all classes and be provided for all children at public expense regardless of their economic status. This is based on a superficial knowledge and an incomplete understanding of preventive pediatrics. Leaving out of the discussion the important question of state medicine and its disadvantages, to extend conferences beyond their use for certain groups would be to make universal use of a poorer method when there is a better one at hand. The development of preventive pediatrics in private practice is taking place with increasing rapidity, although it is not so obvious as the more spectacular but less efficient health center development. If the preventive pediatric viewpoint of the relationship of the physician to the child is to reach the great mass of children in its most efficient form it will only do so through the family physician.

We hold that the pediatrician in practice is fundamentally a family or general practitioner, in that his special interest is in an age period, childhood, rather than in some anatomical part or system of the body, or in some special disease or type of disease, as forms the basis of all other medical specialties. He is, however, more entitled to the term "pediatrician" than the scientist who devotes his time to the chemical or biological study of the diseases occurring in childhood. Both are necessary in the field of pediatrics and the two should work hand in hand as each is dependent upon the other. Without scientific investigation (not necessarily laboratorial in nature), pediatric knowledge would stand still. Without the knowledge obtained and the methods devised by the scientist progress would be slow; but how useless would be the work of the medical scientist without the practitioner to apply

the discoveries of the laboratory worker in the prevention and treatment of disease!

To the criticism made so frequently of the lack of interest in this field on the part of the family physician, the answer is that a man trained to think of medicine in terms of disease alone, in both his medical school training and by years of daily work, cannot be expected to change his viewpoint overnight and think of children in terms of health and of disease secondarily. Despite the impetus given to the scientific study of disease in the pediatric departments of our medical schools in the last ten years, which has been a most desirable and needed development, the teaching of pediatrics must come more and more to center about the teaching of the child's development, both mental and physical, and the way normal development may be attained and pathological deviations and conditions be prevented. When this time comes the physician will have the preventive pediatric viewpoint. It is not that the teaching of the pathology and scientific methods of treatment of disease is to be minimized in any way, but that the developmental phase of infancy and childhood is to be stressed.

For example, let us consider child psychology—a subject of tremendous importance in the development of children, in the etiology of pathological conditions, and in therapeutics. It is at present, as far as pediatrics is concerned, on as low an empirical basis as the art of medicine ever reached. Here is a pediatric field which should be investigated, studied and placed upon a scientific basis and taught as a part of the subject. It is used every day in practice by every pediatrician and one wonders in how many pediatric departments it is considered in the curriculum. Usually its place is taken by a learned discussion of some rare condition observed once in ten years or so in the hospital material, and the chances of its being encountered during the lifetime of an individual physician is about 1 in 1,000 or more.

We have reached a point to-day where the effect of the propaganda efforts of the child hygiene movement has been to arouse such an interest on the part of parents in the health and development of their children that even in the smaller communities they are turning to the physician who has specialized in "children's work." From a small group twenty years ago there are to-day between twenty-five hundred

and three thousand physicians in the United States specializing entirely or partially in pediatrics. This is in large part due to the demand created by the child health movement. Every year sees more and more men returning to the medical centers for postgraduate work in pediatrics. Many of them state they are impelled to do this by the type of service the families in their practice are beginning to demand, and on analysis this usually turns out to be what we include under the term preventive pediatrics. As we have stated this is largely the viewpoint with which the physician approaches his pediatric work. Fundamentally he must be a competent well-trained physician, but his interest must be primarily in the health and development of his patients rather than their ills.

As this book is written primarily for the general practitioner it may not be out of place to discuss one or two questions which in one form or another are frequently asked by postgraduate students. They involve the question of how to develop preventive pediatrics in one's practice, and questions as to the reaction of parents to this viewpoint of the physician's responsibility. Questions are often asked as to the willingness of parents to pay adequately for such service and of their liability to misinterpret the motive of the physician's insistence upon repeated reëxamination of the child when he is not sick.

In the first place there is a decided lack of appreciation on the part of physicians as to the extent to which the community has been educated to the value of preventive medicine and preventive pediatrics. Many families are leaving their family physician to-day and turning to the pediatrician with a statement to the effect that the family physician is fine when the children are sick but has no interest in the children otherwise. In other words they expect and demand supervision of the child's development and turn to the physician who is qualified to give it. This ultimately means that the parents realize that they will obtain better service from the pediatrician when the child is ill. The only way to start such work is to explain frankly to parents the viewpoint of preventive pediatrics, what it purposes to do and what it entails. In a sense the physician is an educator or teacher. Almost without exception intelligent parents will see the point and regard it as a most desirable service for their children. As H. L. K. Shaw so aptly has

put it in the vernacular of the automobile, "the work of the pediatrician should be that of a service station rather than a repair shop." Of course, such service should be adequately paid for and the small bills from time to time are cheerfully paid. One of the distinct faults of the profession has been to look upon the function of giving health advice as something gratis, charging only for the repair work. In the legal profession perhaps the greater source of income comes from advice in regard to keeping out of trouble rather than for getting out of trouble. No one would think of asking a lawyer's opinion as to the management of his affairs without expecting to pay for the years of legal study and training which qualify the lawyer to express the opinion, and the same should hold true for medicine. We have already spoken of the different value placed upon the same advice when it is given free and when it is paid for. Some pediatricians have worked out a system of contract whereby the services in health supervision are paid for by a fixed sum for each year. This is a matter of personal inclination, situation, and type of clientele and is not a matter of fundamentals. To attempt, however, simply to do preventive pediatrics alone and refer the child when ill to a second physician is extremely illogical and a scheme developed from an unfortunate practical necessity of the welfare clinic.

As to the extent of the services very little can be said, as the problem varies with the individual child and depends upon such factors as the type of feeding, etc. For a normal child two or three conferences in the first months, followed by monthly examination for the remainder of the first year, bimonthly in the second year, semiannually until the sixth, and then an annual examination—a birthday examination is psychologically good—about fulfills the requirements. In addition to the examination notes it is well to start a continuous weight chart at birth in duplicate, one for the physician's record and one for the parent.

APPENDIX

RECORD FORMS

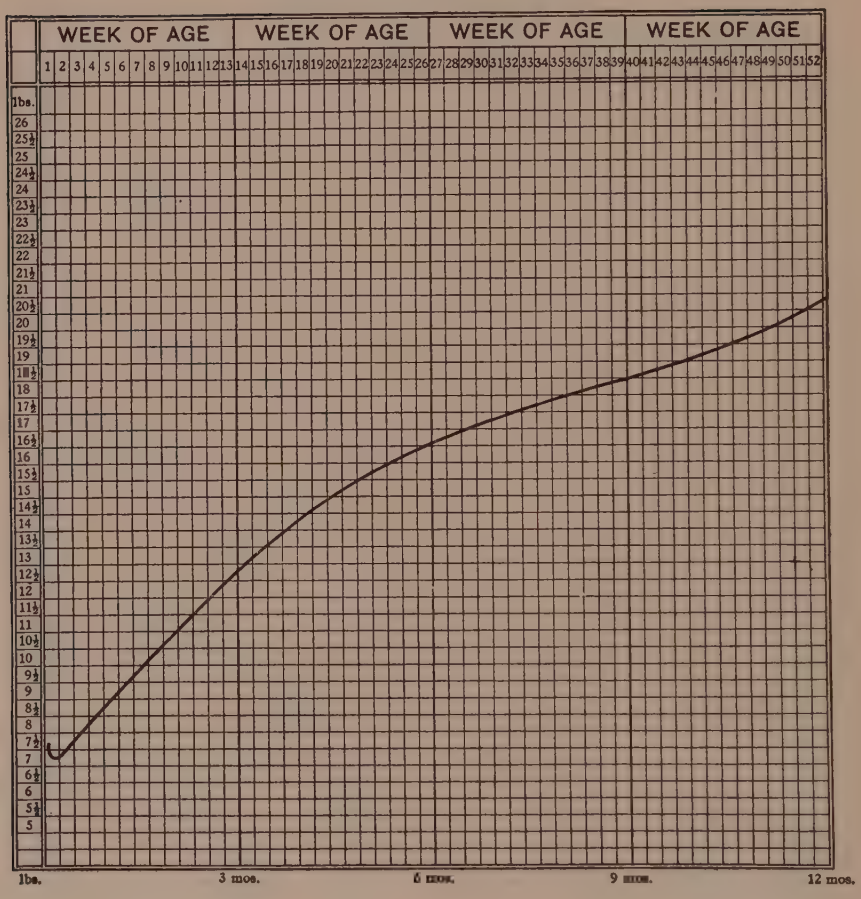
The matter of records is one of importance and hundreds of different forms have been devised by individuals and organizations. As a rule most records are too cumbersome and elaborate and many of them are constructed with record space for but one examination. In addition to the open history and record of the child containing data of attendance, changes in diet, record of illnesses, and medication, which the physician keeps as a matter of routine, a chart of the infant's development is most useful. It has been found of advantage to keep each graph in duplicate, one for the parents and one for the physician. This gives a clear-cut record of the growth and development which tends to keep up the interest of the parents in this important matter.

It should always be kept in mind that a record form is only a method of bookkeeping and that the periodic examination is a sort of annual statement. Records are not an end in themselves. The amount of wasted energy and effort in records is appalling and not infrequently in public health work much of the time which should be given to the child is spent in making entries on records which are filed away, forgotten and unused.

There are a number of good record or weight charts for the first year of life. We illustrate one designed by Holt and published by the American Child Health Association (Form I).

The author and G. T. Palmer have designed a Development Record, 1 to 6 Years, for the child of preschool age (Form II). This chart, which is a folder of two pages and may be obtained from the Child Health Association, furnishes a form for a yearly recording of the essential features of the child's growth and development. It is self-explanatory.

Weight Chart for Baby's First Year



FORM I.—INFANT WEIGHT CHART (American Child Health Association).

Number Name

DEVELOPMENT RECORD

(1 to 6 Years)

Name Address

Date of Birth Is Birth Registered Nationality

Position of child in family 1 2 3 4 5 6

Important Family Data

Full term Delivery, Normal

Premature Forceps

Birth weight Asphyxia

Complication

Breast fed months	Birth	3 mo.	6 mo.	9 mo.	1 Yr.
Breast and comple.	Weight lbs.				
Bottle fed months	Illness in infancy				
Type of food					

Supplement to breast or bottle

	Year	Age
Measles		
Scarlet Fever		
Chicken Pox		
Diphtheria		
Mumps		
Pertussis		

	Year
Vaccination	
Schick Test	
T. A. T.	
Dick Test	
S. F. Toxin	
T. P. T.	

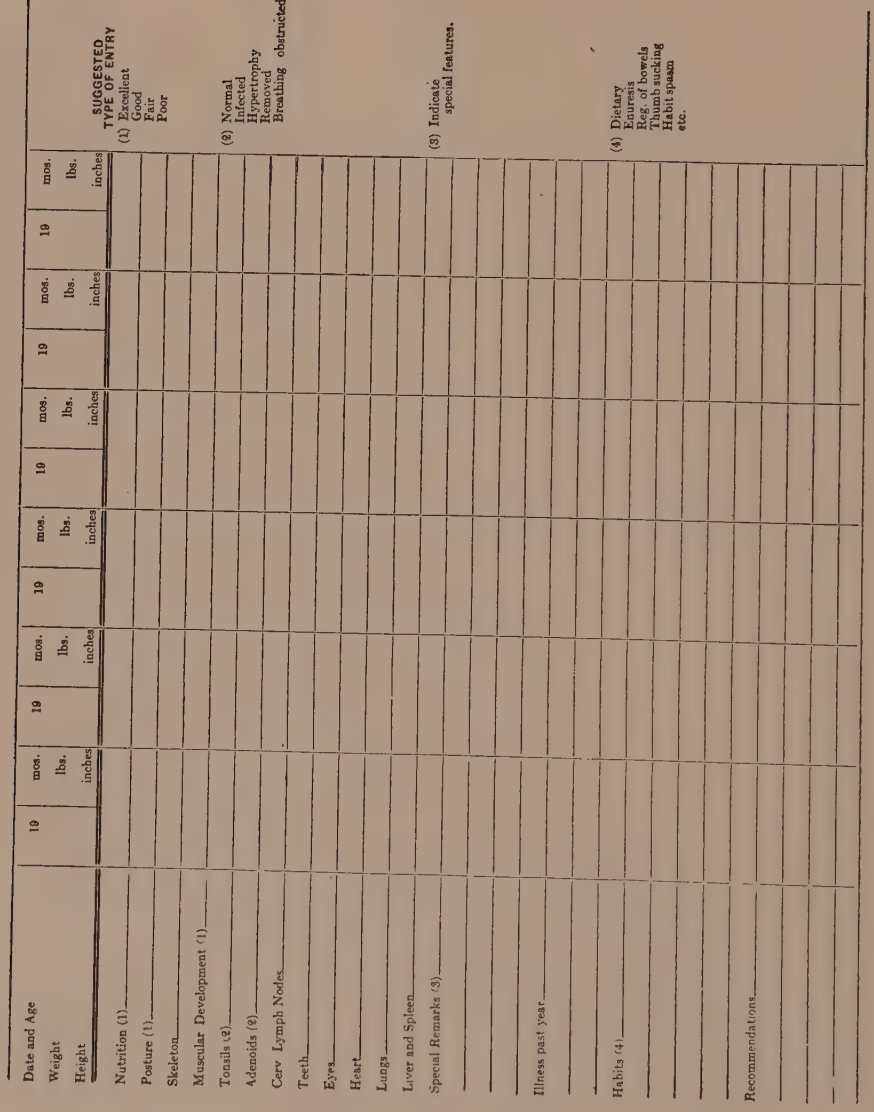
MENTAL DEVELOPMENT

(Use Check Mark √)

1 Year	2 Years	3 Years	4 Years	5 Years
1 Stands and may attempt to walk with support	1 Walks (18 mos.)	1. Draws circle from copy	1. Draws cross from copy.	1. Draws triangle from copy.
2 Understands simple commands	2. Uses simple phrases.	2. Combines two parts of cut picture	2. Repeats sentences of 10 to 12 syllables.	2. Compares two weights.
3 Inhibits simple acts on command	3. Asks for things by name	3. Names three objects in a picture	3 Buttons clothes	3. Laces shoes
4 Will hold cup to drink from	4 Folds paper imitatively	4. Points to eyes, nose, and mouth	4. Washes self.	4. Puts on coat and hat alone.
5. Uses one or two words besides dada and mama	5 Bladder control established	5. Repeats two digits	5. Knows his sex.	5 Counts four pennies

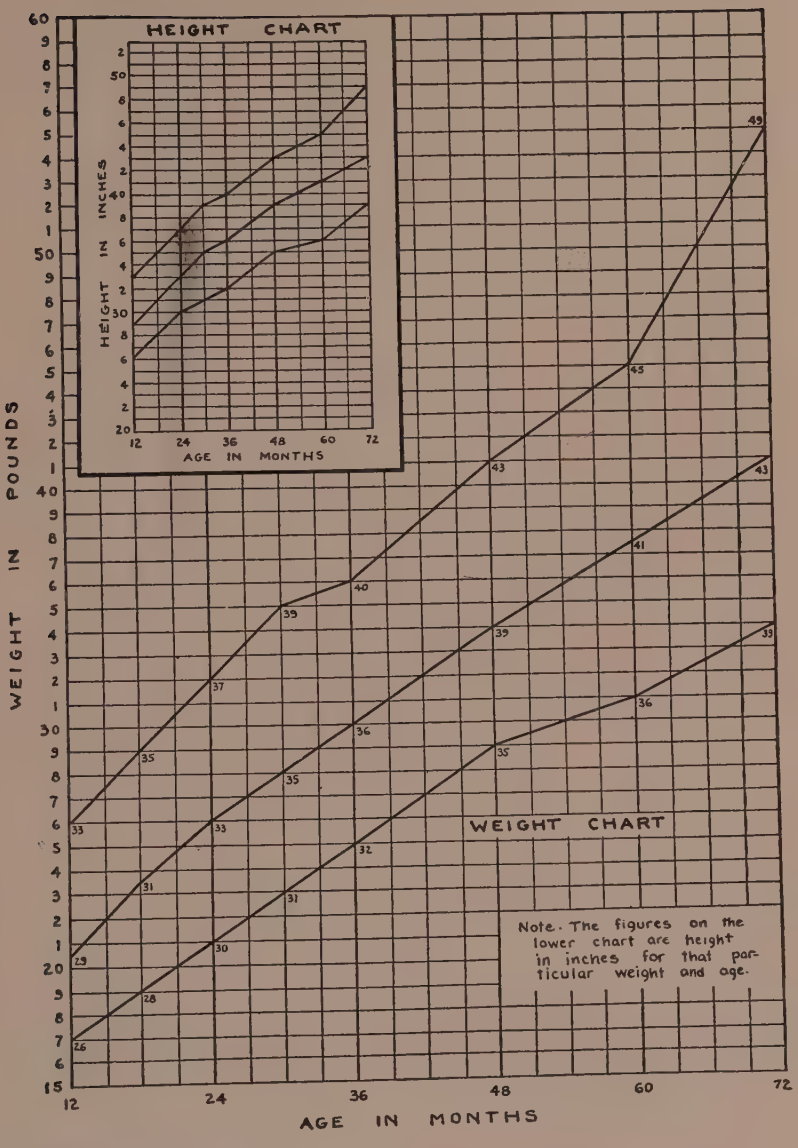
FORM II (Page 1).—DEVELOPMENT RECORD, 1 TO 6 YEARS.

Space for recording the important history for the first year; the common contagious diseases of childhood; immunization data; and a brief outline of mental development.



FORM II (Page 2).—DEVELOPMENT RECORD, 1 TO 6 YEARS.

Form for recording important data of the yearly periodic physical examination and for important developments during the year.



FORM II (Page 3).—DEVELOPMENT RECORD, 1 TO 6 YEARS.

Chart for recording height and weight in form of graph to show development.

HOME WEIGHING RECORD

	19	19	19	19	19	19
January	lbs.	lbs	lbs.	lbs.	lbs.	lbs.
April	lbs.	lbs.	lbs	lbs.	lbs.	lbs.
July	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
October	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.

NOTES

HOW TO USE THE DEVELOPMENT RECORD

The purpose of this form is to furnish a record of the development of children of pre-school age and for the results of periodic examinations.

Page 1—Space is furnished for important data during the period of infancy and in addition record space for the exanthemata and for immunization. At the bottom simple tests of mental development are shown. This last is only sketchy and covers but a few of the essential things which a child should be able to do at a given age

Page 2—This is a simple form for recording the examination of the chief points which are encountered at this age period. It is intended that only brief remarks be put in after each notation.

Page 3—Two specially drawn charts permit the recording of growth as measured by height and weight. On each chart the center line is an average for boys and girls, the upper and lower lines are average extremes. A child of two years of age weighing 27 lbs. would be recorded on the Weight Chart by a mark where the vertical age line and the horizontal weight line cross. The height in inches is recorded in figures at one side and a glance will show whether the child is average weight for height. In this case the average height should be about 34 inches. If, for example, the height is under 33 inches the chart would show at a glance that the weight is above average, and if the height is 37 inches the child is obviously below average weight for his height.

Subsequent measurements made from time to time would be connected by a line which would give the gain of growth and development. The child's height may be marked on the Height Chart and the points connected by a line in a similar manner

FORM II (Page 4).—DEVELOPMENT RECORD, 1 TO 6 YEARS.

Record forms for school age are difficult to arrange in the form of a graph. The following yearly examination form is used by the author and is the final form of a complicated record started a number of years ago which contained a great many specific items which experience has shown may be discarded. They are filed year by year for the individual child (Form III).

RECORD FORM. SCHOOL AGE.

Date 19——

Name. Age. Class.

Height. Average weight for height.

Weight. Relation of weight to average.

Yearly Gain in Height.

" " " Weight.

Nutrition.

Posture.

Musculature.

Vision. O.D. O.S.

Teeth.

Nose and Throat.

Heart. Lungs.

School work past year. Satisfactory. Unsatisfactory.

Recommendations.

FORM III.—YEARLY EXAMINATION FORM.

BIBLIOGRAPHY

Throughout the text references in the form of footnotes have been avoided. The following list of supplemental texts and separata was prepared for graduate students who wish to go more thoroughly into some of the specific phases.

Heredity

Castle. Genetics and Eugenics, Harvard University Press.
Little. Congenital and Acquired Predisposition and Heredity, Abt, System of Pediatrics, Vol. 1.

Nutrition

Emerson. Nutrition and Growth in Children, Appleton.
Grulee. Infant Feeding, Saunders.
Hess. Principles and Practice of Infant Feeding, Davis.
Holt. Food, Health and Growth, Macmillan.

Psychology

Dunlop. Old and New Viewpoints in Psychology, Mosby.
Gesell. Mental Growth of the Preschool Child, Macmillan.
McDougal. Social Psychology. Luce.
Patri. Child Training (Popular), Appleton.
Terman. The Measurement of Human Intelligence, Houghton, Mifflin.
Watson. Psychology from Standpoint of a Behaviorist, Lippincott.

Hygiene

Baker. Child Hygiene, Harper.
Park. Public Health and Hygiene, Lea & Febiger.
Rosenau. Preventive Medicine and Hygiene, Appleton.

Many of the Bulletins and Reports of the Children's Bureau, Department of Labor, Washington, D. C., are of especial value. Among these are:

Prenatal Care, Care of Children Series No. 1.
Breast Feeding, Care of Children Series No. 5.
Infant Care, Care of Children Series No. 2.
Child Care, Care of Children Series No. 3.
Habit Clinic for Preschool Child, Bureau Publication No. 135.
Child Management, Bureau Publication No. 143.
Posture Charts.

The following list of booklets and separata are published by the American Child Health Association, 370 Seventh Ave., New York:

Weight-Height-Age Tables and Charts
Underweight Reference Tables for School Children
Weight Graph for Individual
Development Record, 1 to 6 Years
Booklets for Parents:
The Expectant Mother in the House of Health
The Baby in the House of Health
The Runabout in the House of Health
Infant Mortality Reports (Annual)

CHRONOLOGICAL SCHEMA

The following chronological chart was prepared for teaching purposes and illustrates the general method followed in the Infant Welfare Centers in St. Louis. Any such scheme must be modified to suit the needs or requirements of the individual infant. Experience has shown that when the physician looks after a number of infants there is a tendency to forget to change the diet and régime rapidly enough, and the infant of 10 months is left on the régime of an infant of 7 or 8 months. Such a schema can only be looked upon as a method of general recapitulation. No attempt is made to indicate formulæ as these must be constantly changed for each individual baby.

Age	Breast-Fed Baby	Bottle-Fed Baby	Additions to Diet	Remarks
1 month	Feed at 3-hour intervals if below 7 pounds at birth.	Same	Add orange juice and cod-liver oil (bottle fed).	.....
	Feed at 4-hour intervals if over 7 pounds at birth.	Same	.....	.....
2 months	.....	.....	Same for breast fed.	.....
3 months	Feed at 4-hour intervals.	Feed at 4-hour intervals.	.....	At 4 to 5 months omit night feeding.
5 months	.....	.....	Add milled cereal with small quantity boiled milk to 10 A.M. and 6 P.M. feedings.	.....
6 months	.....	.....	Add vegetable to 2 P.M. feeding.	At 6 to 8 months vaccinate for smallpox.
7 months	Increase quantity of cow's milk with cereal feeding.	.....	Add vegetable soup.	.....
8 months	Wean during month unless summer.	.....	.....	.....
9 to 10 months	.....	.....	Add egg yolk and beef juice. Change milled to unmilled cereals with wide variety.	At 9 to 12 months give diphtheria toxin - antitoxin.
10 to 12 months	.....	.....	Add potato and stewed fruits.	.....
14 months	.....	.....	Add bacon. Use entire egg.	.....
13 to 16 months	Change to 3 meals a day.	.....	.....	.....
18 to 20 months		.....	Add meat.	.....

INDEX